THIRD FIVE-YEAR REVIEW REPORT FOR CALHOUN PARK AREA SITE CHARLESTON COUNTY, SOUTH CAROLINA

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LIST OF ABBREVIATIONS AND ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
ESGTU	Equilibrium Partitioning Sediment Guideline Toxicity Unit
FYR	Five-Year Review
HQ	Hazard Quotient
IC	Institutional Control
MCL	Maximum Contaminant Level
µg/g	Microgram Per Gram
µg/L	Micrograms Per Liter
mg/kg	Milligrams Per Kilogram
mg/L	Milligrams Per Liter
NCP	National Contingency Plan
NPL	National Priorities List
NPS	National Park Service
O&M	Operation and Maintenance
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbon
PRG	Preliminary Remedial Goal
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SCDHEC	South Carolina Department of Health and Environmental Control
SCE&G	South Carolina Electric & Gas Company
SVOC	Semivolatile Organic Compound
USGS	United States Geological Survey
UU/UE	Unlimited Use and Unrestricted Exposure
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the third FYR for the Calhoun Park Area site (the Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two operable units (OUs), both of which are addressed in this FYR. OU1 addresses soil, dense non-aqueous phase liquid (DNAPL) and shallow groundwater. OU2 addresses intermediate groundwater, surface water and sediment in the Cooper River.[1]

EPA remedial project manager (RPM) Ken Mallary led the FYR. Participants included Joel Padgett and Sara MacDonald from South Carolina Department of Health and Environmental Control (SCDHEC); Tom Effinger and Paul Biery from SCANA/South Carolina Electric & Gas Company (SCE&G); Rusty Contrael from SCE&G contractor Ace, Inc.; and Melissa Oakley and Kelly MacDonald from EPA support contractor Skeo.[2] The potentially responsible party (PRP) was notified of the initiation of the FYR. The review began on 10/17/2018.

Site Background

The Site is located on the peninsula of Charleston, South Carolina. From 1855 to 1957, a manufactured gas plant operated on site and produced coal tar as a byproduct of the manufacturing process. Plant operations contaminated area soil, groundwater and sediment. The Site includes areas affected by manufactured gas plant operations, which include an electrical substation property, a large parking garage, National Park Service (NPS) property (which includes the Fort Sumter Tour Boat facility and Liberty Square), the Irish Memorial at Charlotte Street Park, the South Carolina Aquarium, former Luden's Marine property, the former Ansonborough Homes housing project (which now includes Gadsdenboro Park) and capped sediment areas in the Cooper River (Figures 1 and 3). Site surroundings include commercial, industrial and residential developments. The Cooper River borders the Site to the east. The original plant operated on the location of the electrical substation, which is now in use by SCE&G.

[1] The 2002 OU2 Record of Decision (ROD) determined that surface water required no additional action to protect public health and the environment because of previous response actions.

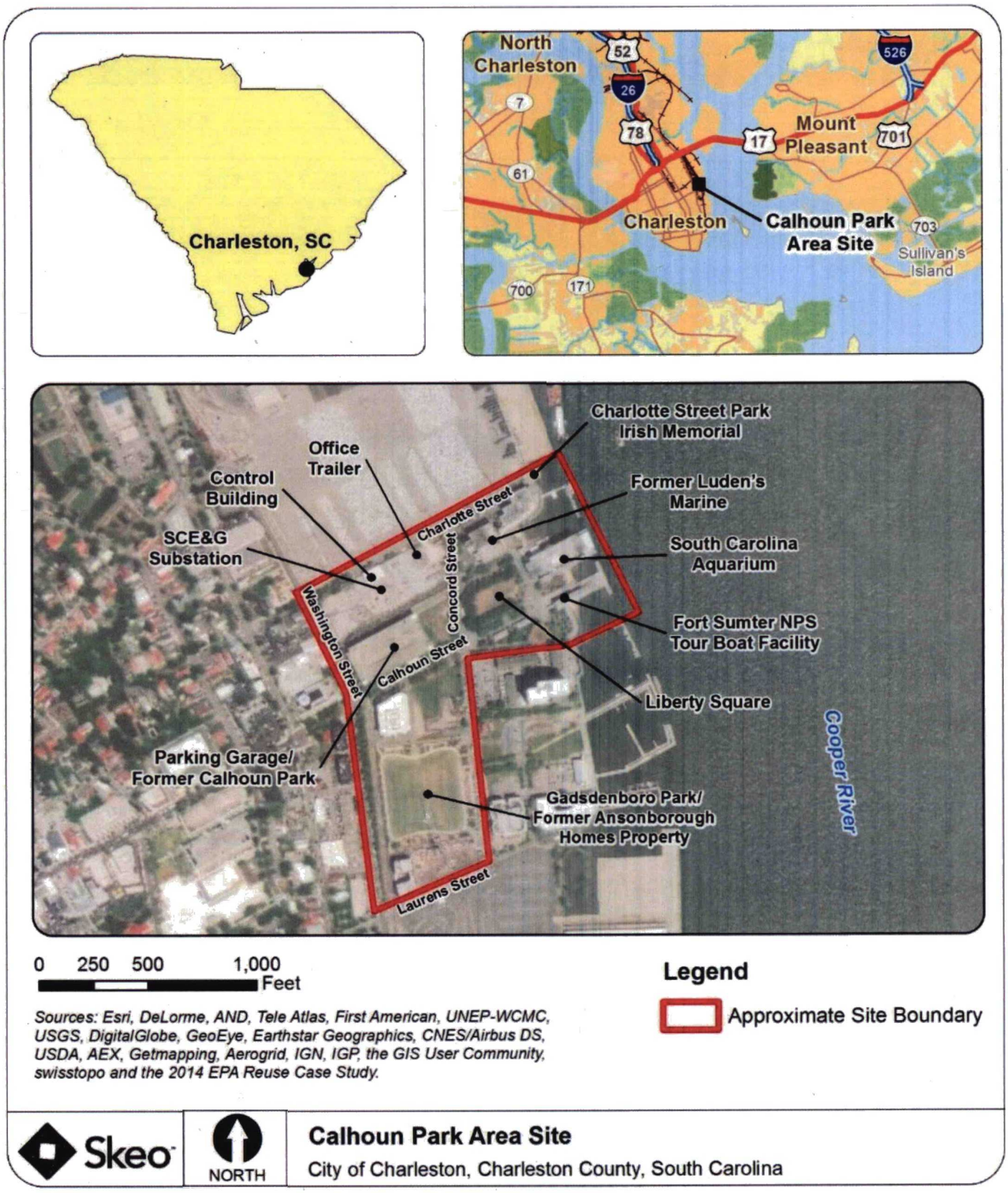
[2] SCE&G is the official PRP and is a subsidiary of SCANA. Dominion Energy purchased SCANA in January 2019. SCE&G's name changed to Dominion Energy South Carolina, Inc. (DESC) on April 15, 2019, but SCANA still exists..

The Site is in an area of filled tidal creek channels and fill placed along the Cooper River shoreline. The following geological units are under the Site: fill material/upper sand, upper clay, upper intermediate sand, middle intermediate sand, lower intermediate sand and the Ashley Formation of the Cooper Group. Shallow groundwater at the Site is in the fill material/upper sand; intermediate groundwater is in the interval between the upper clay and deeper Ashley Formation. The upper clay unit is relatively shallow (about 10 feet below ground surface) and generally serves as a unit of lower permeability. However, there are some permeable areas in the upper clay, and the clay was likely breached during installation and/or removal of the gas holder on the electrical substation property.[3] Therefore, the DNAPL source areas are mostly in the shallow aquifer, but DNAPL is also observed in the intermediate aquifer.

Drinking water in the area is supplied by the city of Charleston (the City), which uses an upgradient surface water supply that is not influenced by the Site. Groundwater near the Cooper River is saline or brackish. The Cooper River is used for recreational fishing. Refer to Appendix A for additional resources, to Appendix B for site status information and to Appendix C for the Site's chronology of events.

[3] The former gasholder is a circular, subsurface structure with walls constructed of 1-inch thick steel and cemented brick, a wooden floor and an interior filled with debris and soil.

Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Calhoun Park Area		
EPA ID: SCD987581337		
Region: 4	**State:** SC	**City/County:** Charleston/Charleston
SITE STATUS		
NPL Status: Non-NPL		
Multiple OUs? Yes	**Has the Site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Ken Mallary (EPA) and Melissa Oakley and Kelly MacDonald (Skeo)		
Author affiliation: EPA and Skeo		
Review period: 10/17/2018 – 8/22/2019		
Date of site inspection: 12/18/2018		
Type of review: Statutory		
Review number: 3		
Triggering action date: 8/22/2014		
Due date *(five years after triggering action date)*: 8/22/2019		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Before the 1998 remedial investigation (RI), several environmental investigations were performed on parts of the Site, including the former Ansonborough Homes, Calhoun Park (now the location of the on-site parking garage) and the Cooper River.[4] In 1992, the Site received a Hazard Ranking System score sufficient for National Priorities List (NPL) listing, but listing was suspended based on cooperation by SCE&G (the PRP). Site cleanup was conducted under an alternative approach. In January 1993, SCE&G entered into an Administrative Order with the EPA to perform an RI.

[4] Preliminary investigations conducted in the early 1990s for the former Ansonborough Homes property were used to inform the remedy selection process. As the property was included in initial investigations, it is considered part of the Site. However, based on investigation findings, no remedy was selected for the former Ansonborough Homes property. Because preliminary investigations identified some contamination associated with former wood treating activities, SCDHEC manages the former Ansonborough Homes property under the authority of the state's Voluntary Cleanup Program.

Evaluation of human health risk associated with the Site is discussed in the 1994 Baseline Risk Assessment by Black & Veatch, the 1995 Assessment of Risk for the National Park Service Property by the EPA, and the 1996 Revision to the Risk Assessment by the EPA. For OU1, the risk evaluation for commercial workers and future residential populations resulted in unacceptable risk levels associated with soil and groundwater. Risks under the construction worker and long-term worker scenarios were largely driven by incidental ingestion and/or dermal contact with surface and subsurface soils. The risk under the future resident scenario was driven primarily by exposure to shallow groundwater.

For OU2, the potential carcinogenic risks associated with exposure to intermediate groundwater by a hypothetical child or adult resident exceeded the EPA target cancer risk range. Similarly, potential noncarcinogenic risks associated with exposure to intermediate groundwater by a hypothetical child or adult resident exceeded a hazard index of 1.0. The risk from human exposure to sediment was not evaluated because human exposure to sediment was deemed unlikely. Sediment presented ecological risks from polycyclic aromatic hydrocarbons (PAHs) with hazard quotients (HQs) based on the EPA's equilibrium partitioning sediment guideline toxicity units (ESGTUs) above 1. At the time of the 2002 OU2 Record of Decision (ROD), about 70 percent of the area with ESGTU-HQs equal to or greater than 1 was covered by permanent structures and previously-installed sand blankets, which reduced but did not eliminate the direct contact pathway for ecological exposures. Contaminants of concern (COCs) are included by media in Table 1 below.

Table 1: COCs, by Media

COC	Media
Arsenic	Groundwater and soil
Benzo(a)pyrene	Groundwater and soil
Cyanide	Groundwater
Benzene	Groundwater
2,4-Dimethylphenol	Groundwater
Ethylbenzene	Groundwater
Beryllium	Groundwater
Lead	Groundwater
Carbazole	Groundwater
Mercury	Groundwater
Chrysene	Groundwater
Naphthalene	Groundwater
Chromium	Groundwater
Nickel	Groundwater
Copper	Groundwater
Toluene	Groundwater
Xylenes (total)	Groundwater
PAHs	Sediment
Sources: 1998 ROD Section 7.1.1 and 7.1.2 and 2002 ROD Table 8-1 and Section 8.2	

Response Actions

Pre-ROD

To support site redevelopment construction activities, several early cleanup actions were conducted before final remedy selection for OU1. These actions included installing several sediment containment structures (such as sand blankets to minimize the resuspension of contaminated sediment during area redevelopment), addressing contaminated stormwater discharges (by upgrading a Calhoun Street storm drain that had been transporting contaminants from the Site to the Cooper River, resulting in contaminated sediment, and installing a subsurface sheet piling wall to prevent the new drain from acting as a preferential pathway for groundwater to the river), and investigating and responding to an oily sheen and seeps observed on the river at the end of Charlotte Street (by using absorbent booms and investigating the coal tar seeps). The 1998 OU1 ROD includes additional details regarding those actions.

Post-ROD

The EPA selected the Site's remedies in the 1998 OU1 ROD, 2005 OU1 Explanation of Significant Differences (ESD) and 2002 OU2 ROD. OU1 addresses DNAPL source areas, shallow groundwater contamination and soil. The DNAPL source areas were identified as the former gas holder, the former rail spur and the former oil tanks (see Figure 2 for a map of source areas and Figure D-1 in Appendix D for a historical site map). The DNAPL source areas are mostly in the shallow aquifer, though DNAPL is also observed in the intermediate aquifer.

Operable Unit 1

The 1998 OU1 ROD included the following remedial action objective (RAO) for soil:

- Ensure soil exposure concentration levels are adequately protective for future construction workers and long-term workers.

The 1998 OU1 ROD noted that the while the goal of the remedy is to restore groundwater to Maximum Contaminant Levels (MCLs), restoration to MCLs may be technically impracticable. Therefore, the ROD stated that the shallow groundwater/DNAPL remedy shall at a minimum achieve the following:

- Source areas:
  - Removal or treatment of DNAPL to the maximum extent practicable.
  - Containment of potentially non-restorable source areas.
- Shallow groundwater:
  - Restoration of aqueous contaminant plumes.

The 1998 OU1 ROD selected the following remedy:

- Excavation and transportation of contaminated soil to a permitted landfill followed by backfilling excavated areas with clean fill.
- DNAPL source removal from the shallow and intermediate aquifers via an extraction system.
- Treatment of the shallow groundwater plume through a combination of recovery wells/filtration system and phytoremediation.
- Additional sampling of surface water and sediment, following mitigation of coal tar discharge into the Cooper River, to fully delineate the extent of contamination and potential threat to aquatic and terrestrial life.

The OU1 ROD did not specify an anticipated timeframe for this remedy but did note that the full-scale groundwater/DNAPL remedy would be an iterative process that must be conducted for a sufficient period of time before its ability to meet applicable cleanup levels can be fully evaluated.

Cleanup goals for OU1 shallow groundwater are included in Table 2.

Table 2: 1998 OU1 ROD Shallow Groundwater COC Cleanup Goals

Shallow Groundwater COC	1998 ROD Cleanup Goal (mg/L)
Arsenic	0.05
Benzene	0.005
Benzo(a)pyrene	0.0002[a]
Beryllium	0.004
Carbazole	0.005[b]
Chromium	0.1
Chrysene	0.020[c]
Copper	1.3
Cyanide	0.2
2,4-Dimethylphenol	0.7
Ethylbenzene	0.7
Lead	0.015
Mercury	0.002
Naphthalene	1.5
Nickel	0.1
Toluene	1.0

Notes:
Source: 1998 OU1 ROD Section 7.1.2
a. Represents PAHs as a group.
b. Based on actual risk calculation rather than MCLs.
c. The ROD cleanup goal for chrysene was 0.02 mg/L, but the June 2018 Shallow Groundwater Monitoring Report notes that the chrysene cleanup goal was changed to 0.2 mg/L and that this was approved in a SCDHEC letter dated May 23, 2002.
mg/L = milligrams per liter

In the *Interim Remedial Action Report for OU #1*, dated August 2006, it is stated in the Preface:

"It is envisioned that SCE&G will submit a draft TI (Technical Impracticability) evaluation for not achieving the ARAR of MCLS for shallow groundwater, prior to the next five-year review. The basis for this evaluation was presented in the ROD..."

In Section 7.1.2, Groundwater/NAPL of the ROD for OU #1, it is stated that:

"The NAPLs removal will be monitored to evaluate the practicability of such actions. Should complete source removal or treatment prove impracticable, the use of migration controls or containment measures will be taken for the non-restorable source areas. ***The determination of technical impracticability will be made by EPA, in consultation with SC DHEC, based on site-specific characterization data and remedy performance data*** [emphasis added] ....

Should EPA ultimately make a determination of technical impracticability based on evaluation of the supporting data, the remedy would be re-evaluated and documented by a ROD amendment.... "

In Section 9.2.1, NAPL/Groundwater of the ROD for OU #1, it is stated that:

"The goal of EPA's groundwater/NAPL remedy is the restoration of impacted groundwater at these source areas to the ARAR-based cleanup levels, Maximum Contaminate Levels specified by the Safe Drinking Water Act. ***However, EPA recognizes that restoration to these levels may be technically impracticable given the characteristics of NAPL, limitations in remediation technology and/or complex hydrogeology.*** *"*

Therefore, it is recommended that a Technical Impracticability (TI) Evaluation be completed in accordance with EPA OSWER Directive 9234.2-25, Guidance for Evaluating the Technical Impracticability of Groundwater Restoration (EPA 1993), during the next 5-year review period. A TI waiver is necessary due to the presence of free-phase and residual DNAPL in multi-lithological zones making it technically impracticable to restore groundwater within a reasonable timeframe. Should the TI Evaluation be approved by the regulatory agencies, the ARAR-based, MCLs will be waived for the areas defined within the evaluation.

Preliminary Remedial Goals (PRGs) included in the 1998 OU1 ROD for soil are included in Table 3 below.

Table 3: 1998 OU1 ROD Soil PRGs

Soil COC	1998 ROD PRG (mg/kg)[a]
Arsenic	7.6
Benzo(a)pyrene (EQ)[b]	1.7

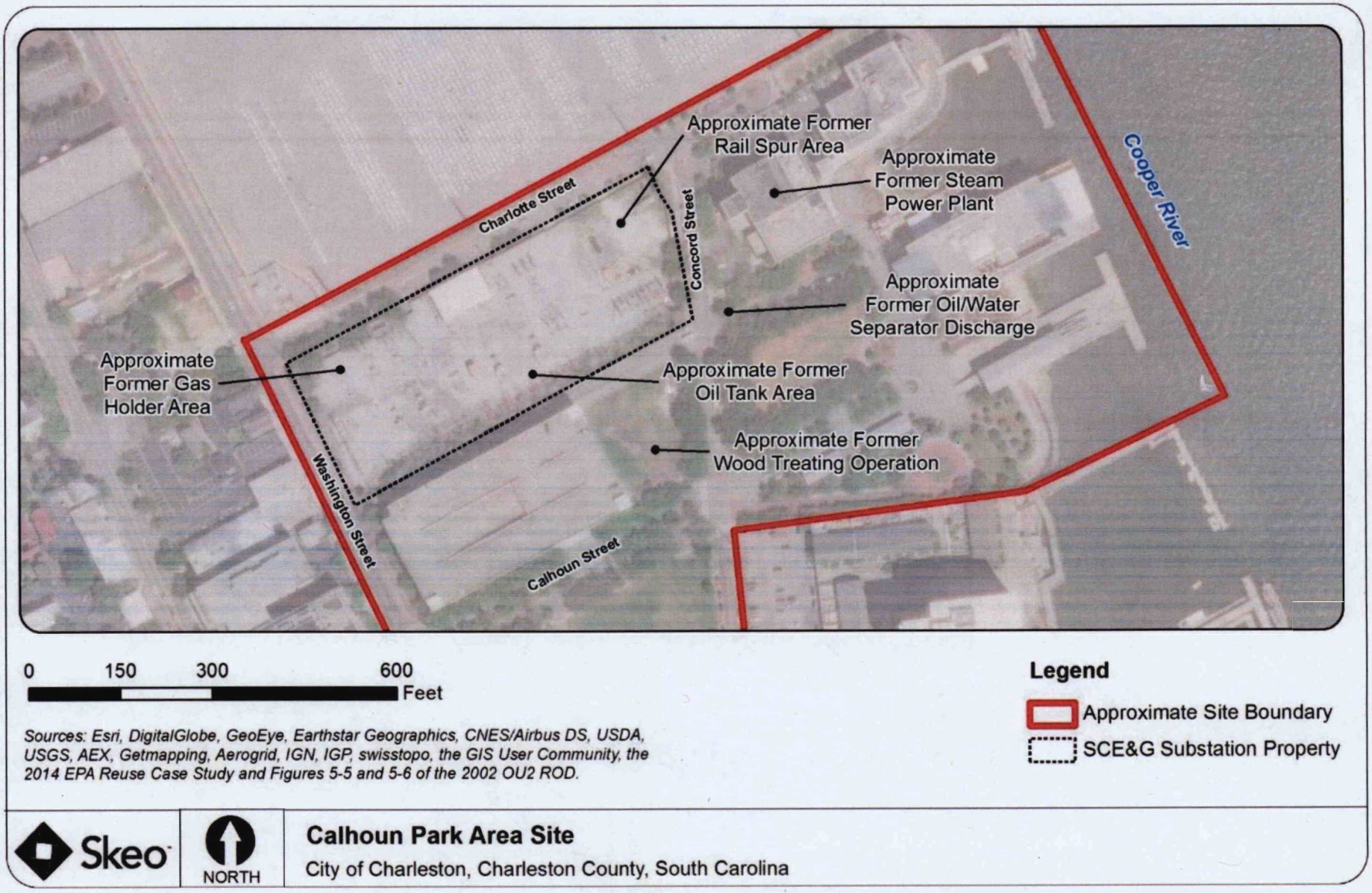
Notes:
Source: 1998 OU1 ROD Section 7.1.1

a. These values were based on data presented in the risk assessment. The PRGs are not the concentrations above which all soils should be remediated. The PRGs are based upon the Upper Confidence Limits (UCL) in the same manner as the risk assessment used UCL in calculating the soil exposure point concentrations for determining overall site risk.
b. EQ = Toxicity Equivalents. The toxicity associated with benzo(a)pyrene is used as a point of reference for other carcinogenic PAHs.

mg/kg = milligrams per kilogram

During remedy implementation, three additional source areas were found: a former wood treating operation, depositional areas around the former steam plant, and the discharge outfall of the former oil-water separator. See Figure 2 for a map of source areas and Figure D-1 for the historical site map. The EPA determined that performance standards could be achieved by methods other than those prescribed in the original ROD for all the Site's source areas. In 2005, the EPA modified the original OU1 remedy in an ESD. The modified remedy included excavation of DNAPL source areas and installation of a perimeter DNAPL collection trench with over 50 recovery wells. The modified remedy also specified mixing chemical oxidants into the soil used to backfill the excavated areas and spot injections of oxidation products to address shallow groundwater contaminated by source material that was inaccessible for excavation.

Figure 2: Source Area Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Operable Unit 2

OU2 addresses intermediate groundwater, DNAPL in the intermediate sand unit that affects intermediate groundwater, sediment and surface water. The 2002 OU2 ROD determined that surface water required no additional action to protect public health and the environment because of previous response actions. The 2002 OU2 ROD included the following RAOs:

- Intermediate groundwater:
  - Removal or treatment of DNAPL to the maximum extent practicable.
  - Containment of potentially non-restorable source areas.
  - Restoration of aqueous constituent plumes.
  - Prevent exposure to groundwater having concentrations above acceptable risk levels.
- Sediment:
  - Prevent exposure of benthic organisms to impacted sediment.
  - Prevent the volume of PAH-contaminated sediment from increasing.
  - Reduce the volume of PAH-contaminated sediment.
  - Prevent the erosion and provide for the long-term stability (reduce mobility) of impacted sediments.

The 2002 OU2 ROD included the following remedial components:

- DNAPL removal to the extent practicable using either stationary or portable pumping equipment and transportation of recovered DNAPL off site for reuse or treatment and disposal.
- In situ treatment of contaminated groundwater in the intermediate zone, using increasing dissolved oxygen concentrations to stimulate microbial activity and biodegradation, or the direct destruction of dissolved constituents via chemical oxidation.
- Groundwater monitoring in the contaminated part of the intermediate zone and at sentinel well locations.
- Restrictions to future uses of intermediate groundwater on SCE&G property through a deed notification.
- Evaluation of containment measures if DNAPL removal and institutional measures do not help prevent migration of dissolved phase constituents.
- Monitoring of existing sand blankets at the perimeter of existing structures and along the west bank of the Cooper River.
- Maintenance of the existing sand blankets, if required, and augmentation of the sand blankets depending on supplemental total organic carbon and PAH data collected during the remedial design.

The 2002 OU2 ROD estimated a five-year DNAPL recovery period and a 12-year intermediate groundwater monitoring period. Cleanup goals for OU2 intermediate groundwater are included below in Table 4.

Table 4: 2002 OU2 ROD Intermediate Groundwater COC Cleanup Goals

Intermediate Groundwater COC	2002 ROD Cleanup Goal (mg/L)
Benzene	0.005
Benzo(a)pyrene	0.0002
Carbazole	0.005[a]
2,4-Dimethylphenol	0.7[a]
Ethylbenzene	0.7
Naphthalene	1.5[a]
Toluene	1.0
Xylenes (total)	10.0

Notes:
Source: 2002 OU2 ROD Table 8-1
a. Indicates cleanup goals derived from risk-based calculations, rather than drinking water standards (MCLs).
mg/L = milligrams per liter

Similar to shallow groundwater, restoration of intermediate groundwater to MCLs may be technically impracticable. Therefore, it is recommended that a TI Evaluation for intermediate groundwater also be completed in accordance with EPA OSWER Directive 9234.2-25, Guidance for Evaluating the Technical Impracticability of Groundwater Restoration (EPA 1993), during the next 5-year review period. A TI waiver is necessary due to the presence of free-phase and residual DNAPL in multi-lithological zones making it technically impracticable to restore groundwater within a reasonable timeframe. Should the TI Evaluation be approved by the regulatory agencies, the ARAR-based, MCLs will be waived for the areas defined within the evaluation.

The 2002 OU2 ROD stated that the remedial goal for contaminated sediments was to address PAH-contaminated sediments with ESGTU HQs that were greater than 1.

Status of Implementation

Operable Unit 1

Soil

SCE&G completed the soil and source material excavation in eight phases from August 1998 through November 2004, with soil management and disposal activities extending to the end of 2005. This included removal of about 63,400 tons of contaminated soil, sediment, coal tar and debris. Soil was removed from the following areas to be protective of future commercial and construction workers: substation, parking garage, NPS and Luden's Marine properties. Soil excavation areas are shown on Figure D-2 in Appendix D. Contaminated material was sent off site for recycling or disposal. Excavated areas were backfilled.

As noted in the 2005 ESD, additional source material and soil removal activities were completed during the OU1 remedy implementation because additional source areas were discovered, and it was determined that the performance standards could be achieved using alternate methods described below. Concurrent with the sitewide redevelopment, a significant volume of DNAPL was removed during the soil excavation described above (the original remedy prescribed DNAPL recovery via an extraction

system). There were some areas inaccessible for excavation, including the former gas holder source area, which is located within the electrical substation. The substation and other existing site features (i.e., underground utilities and structures) created obstacles to removing DNAPL. Additional steps were taken to address DNAPL in inaccessible areas, including installation of a perimeter collection trench with over 50 DNAPL recovery wells and mixing chemical oxidants into the soil used to backfill the excavated areas and spot injections of oxidation products. See below for more information on the DNAPL recovery. Lastly, due to the Site's proximity to the Cooper River and the shallow water table, groundwater collection, storage and disposal was necessary during soil excavation. During excavation activities, over 3,000,000 gallons of water were removed and transferred to approved treatment facilities. These source material removal activities contributed significantly toward achieving other remedial objectives.

DNAPL

The following DNAPL source areas were remediated by excavation: depositional areas around the former steam plant, the former wood treating operation, the former rail spur, and the former oil tanks (see Figure 2). The discharge outfall of the former oil-water separator received oxidant injections.

As documented by the 2005 ESD, a collection trench was installed with over 50 recovery wells around the former rail spur and former oil tank source areas to increase the overall effectiveness of the remedy by recovering DNAPL via the trench. See Figure 4 for the location of the trench segments. DNAPL recovery activities also include automated recovery from DRW-06 in the former gas holder source area and recovery from groundwater monitoring wells and other DRW wells where DNAPL typically accumulates. DNAPL removal began in October 1998 and is ongoing. See the Data Review section of this FYR for more information.

Shallow Groundwater

For treatment of the groundwater plume, a combined approach was used that included:

- Installation and operation of DNAPL recovery wells.
- Removal and treatment at approved treatment facilities of over 3,000,000 gallons of water resulting from excavation and construction activities.
- Amending backfill with commercially-available oxidants.
- Point source injection of commercially-available oxidants.
- Phytoremediation.
- Routine groundwater monitoring.

As documented in the 2005 ESD, oxidation products were introduced into the subsurface soil and shallow groundwater by amending excavation backfill material and conducting spot injections, aiming to enhance bioremediation. Areas with enhanced backfill and shallow injections are shown on Figure D-2 in Appendix D; the areas with enhanced backfill include the former wood treating operation and former steam plant deposition source areas. In the early 2000s, injections occurred in the following source areas: the former rail spur, former wood treating operation and the discharge outfall of the former oil-water separator.

The United States Geological Survey (USGS) and SCE&G have implemented phytoremediation (the treatment of environmental contamination using plants) at the Site. Trees planted by SCE&G uptake contaminated groundwater. The 2009 FYR estimated 105,000 gallons of contaminated groundwater are

taken up over an eight-month growing season. Benzene, toluene, naphthalene and other coal tar-related PAHs have been detected in tree tissue samples.

DNAPL recovery and groundwater monitoring are ongoing; see the Data Review section of this FYR for more information.

Additional Sampling
The OU1 remedy required that after coal tar discharge to the Cooper River is stopped, surface water and sediment be sampled to delineate the extent of contamination. Seep mitigation activities along Charlotte Street concluded in April 1999 and included excavation of 1,542 tons of soil/sediment and debris and placement of a sand blanket over the excavated area.

Operable Unit 2

Intermediate Groundwater
Two DNAPL recovery wells (DRW-52C and DRW-53C) were installed on site to provide additional locations in the intermediate unit; DNAPL removal from various intermediate wells is ongoing. In-situ groundwater treatment was conducted via addition of chemical oxidants to treat dissolved phase contaminants either biologically or through chemical destruction. The two chemical oxidants (PermeOx® Plus or EHC-O™, and Fenton's reagent) were selected during the design phase based on accessibility, extent, estimated constituent mass and regulatory requests. Injections occurred from May 2005 to September 2006. Injection areas are depicted on Figures I-6 and I-7 in Appendix I. Post-remedial groundwater sampling continues to monitor intermediate groundwater; see the Data Review section of this FYR for an assessment of the effectiveness of these injections.

Sediment
Sediment was contaminated from the former Charlotte Street seep area and the former Calhoun Street drain outfall. Before area redevelopment, a protective sand layer at least 2 feet thick was installed. The OU2 ROD sediment remedy called for monitoring, maintenance and augmentation (if needed) of existing sand blankets. Regulatory agencies later approved use of more stable and permanent capping materials than the sand in place (i.e., concrete mats and stone riprap). The additional sediment remediation work was divided into three areas (Areas 1, 2 and 3) along the western bank of the Cooper River, as shown on Figures 3 and 5. Area 1 is at the end of the Charlotte Street Park underneath an observation platform. Area 2 is between the South Carolina Aquarium and the NPS Tour Boat Facility. Area 3 is south of the NPS Tour Boat Facility. Generally, contaminated sediment in these areas was capped near the shoreline where the existing sand blanket may not have been thick enough to prevent exposure of benthic organisms to contaminated sediment. The 2013 sediment remedial action report stated that because of the stability and permanence of the capping materials installed and with completion of development activities along the adjacent riverside property, no further monitoring or inspection of the capped areas is required. The 2013 sediment remedial action report also noted that if future development, construction or other activities warrant disturbing or modifying the capping materials, SCE&G and the agencies will be notified by the landowners and appropriate measures will be taken to ensure that the sediment remediation measures remain intact.

Several supplemental sediment-related activities were also conducted during the remedial action; while not specified in the ROD, they were completed as part of the sediment capping activities described in the work plan. These activities included extending an existing oyster research study area near the aquarium and regrading a small sand mound west of the oyster study area (to mitigate a "scouring effect" the sand

mound had on the oyster study area). This included placement of bagged oyster shells north and south of the existing research area.

Construction for the caps over Areas 2 and 3 occurred in July and August 2006. For Area 1, SCE&G and the City worked together on capping so it could be conducted in conjunction with the planned construction of a city park at the end of Charlotte Street, as the City had plans to develop an observation platform extending out over the river and covering most of Area 1. The city park construction was delayed for several years due to technical and budgetary constraints, so the Area 1 remedial activities were completed in two phases. The first phase (sand blanket installation) was conducted in March 2010 and the second phase (geotextile and riprap installation) was completed in December 2012. The City's construction of the observation platform was completed in June 2013.

Institutional Control (IC) Review

The OU2 ROD called for institutional controls restricting future uses of intermediate groundwater on the SCE&G property. Institutional controls were implemented for the SCE&G property in September 2018 via a Declaration of Covenants and Restrictions. This institutional control prohibits consumptive groundwater use; prohibits use of the property that interferes with remediation; precludes residential, agricultural, day care, school or elder care facilities or recreational uses; prohibits non-remedial well drilling; and precludes soil excavation without EPA approval.

Decision documents do not require institutional controls for soil, but they are in place on the SCE&G property as noted above. No institutional controls are in place for soil on other site properties, but they do not appear to be needed as the cleanup of those areas has been completed and the soil cleanup goals (listed in Table 3) are protective of a residential exposure scenario. See Appendix K for more detail. The former DNAPL source area located at the discharge outfall of the former oil-water separator is outside of the institutional control on the substation property. However, that source was remediated with oxidant injections; therefore, land use restrictions for the area are not required.[5]

While institutional controls for groundwater were called for and have been implemented on the substation property, contaminated groundwater is present outside of this property. Part of the Charleston City Code (Ord. No. 2010-110, § 1, 7-20-10) acts as an institutional control because it includes a requirement that dwelling structures must have fresh water from a SCDHEC-approved well or from a public water system supplied to the individual building through an on-site water meter.[6] This city ordinance provides protection at the Site by preventing use of contaminated groundwater. In addition, groundwater quality in the site vicinity is brackish and unsuitable for human consumption.

Decision documents also do not require institutional controls for sediment, though contamination beneath the capped areas could potentially pose risks to ecological receptors. Implementation of conventional institutional controls on riparian properties presents a wide range of challenges and is often deemed infeasible. In order to ensure the long-term integrity of the caps, the PRP visually inspects the sediment caps during routine O&M activities. As the caps are located within a public waterway, no work of any kind can be performed in those areas without first obtaining prior permission and required

[5] While not required by the remedy, prior to any digging in the vicinity of the discharge outfall of the former oil-water separator, the property owner must notify the South Carolina 811 utility locating service to ensure that any excavation does not disrupt underground utilities and to ensure that the work is performed in accordance with local regulations.
[6] Accessed 1/21/19 at https://library.municode.com/sc/charleston/codes/code_of_ordinances?nodeId=COCHSOCA.

permits from several regulatory agencies. That requirement acts as an institutional control that prevents activities that could potentially impact the integrity of the caps.

Table 5: Summary of Planned and/or Implemented Institutional Controls (ICs)

Media, Engineered Controls, and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil	Yes	No	4591304002 (SCE&G property)	Prevent land use that interferes with remediation and prevent exposure to remaining contamination/DNAPL	2018 Declaration of Covenants and Restrictions
Groundwater	Yes	Yes	4591304002 (SCE&G property)	Restrict future uses of intermediate groundwater on the SCE&G property	2018 Declaration of Covenants and Restrictions
Groundwater	Yes	No	City of Charleston	Restrict city-wide use of groundwater	Ord. No. 2010-110, § 1, 7-20-10
Sediment	Yes	No	See Figure 3	Ensure the long-term integrity of the caps in order to prevent ecological exposure to contaminated sediment	Routine visual inspections by the PRP ensure the continued integrity of the sediment caps; local regulatory requirements prohibit activities that could potentially impact the integrity of the caps.

Figure 3: Institutional Control Map

Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Systems Operations/Operation and Maintenance (O&M)

DNAPL recovery and groundwater monitoring are ongoing; these are explained in further detail in the Data Review section of this FYR. Intermediate groundwater monitoring is performed in accordance with 2007 Revised Technical Memorandum #003, and shallow groundwater monitoring is performed in accordance with the 2007 Technical Memorandum #001. SCE&G submits groundwater monitoring reports every 9 months to the EPA and SCDHEC.

In 2010, the site O&M personnel staffing was changed to a 2-week on and 1-week off schedule, which has been effective in maximizing available DNAPL removal (by allowing for DNAPL recharge) while reducing labor and overall site costs. Recovered DNAPL is contained in 55-gallon drums, temporarily staged on site and periodically transported to an approved facility for recycling via fuel blending at a cement kiln. From October 2000 to May 2018, 736 drums were transported to recycling facilities. Wastewater generated on site from O&M activities is stored in a 20,000-gallon frac tank and then filtered through sand and carbon before discharge to the publicly-owned treatment works. SCE&G submits DNAPL removal reports semiannually to the EPA and SCDHEC. Maintenance is conducted as needed.

SCE&G has recommended the following changes to optimize the shallow groundwater monitoring program: 1) change the sampling schedule to be every 2 years for sentinel wells, 2) re-designate MW-14 as a sentinel well, and 3) remove the following constituents without cleanup goals from the monitoring program based on limited detections at low levels: acenaphthylene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene.

SCE&G has also recommended optimizations to the intermediate groundwater monitoring program. The EPA and SCDHEC will determine if these changes are appropriate.

O&M is not required for the soil cleanup areas, phytoremediation trees or the sediment caps. The 2013 sediment remedial action report stated that because of the stability and permanence of the capping materials installed and with the completion of development activities along the adjacent riverside property, no further monitoring or inspection of the capped areas is required. However, in order to ensure the long-term integrity of the sediment caps, the PRP performs visual inspections of the caps during routine O&M activities.

III. PROGRESS SINCE THE PREVIOUS REVIEW

Activities that have been conducted at the CPA Site since the previous five-year review in August 2014 include:

- **On-going DNAPL Monitoring and Removal Activities**

  Operation and maintenance of the DNAPL removal systems in place at the CPA Site continued throughout the five-year period. Approximately 11,195 gallons of DNAPL have been recovered and transported off-site for recycling since September 2014. Activities are documented in semi-annual reports submitted to U.S. EPA and SCDHEC. Ten semi-annual reports have been submitted since the previous five-year review.

- **Groundwater Monitoring**

  Shallow and intermediate groundwater monitoring programs have continued throughout the five-year period. Activities and findings are documented in reports submitted to U.S. EPA and SCDHEC for each

monitoring event. Since September 2014, a total of seven (7) shallow and six (6) intermediate groundwater monitoring events have been conducted at the CPA Site.

- **Phytoremediation Area Monitoring and Maintenance**

  In conjunction with the United States Geological Survey (USGS), monitoring and maintenance of the phytoremediation area at the CPA Site continued throughout the five-year period. The USGS maintains records of activities and findings for technology research and development purposes.

- **Institutional Controls**

  As recommended in the previous five-year review, institutional controls for the SCE&G property were implemented via a Declaration of Covenants and Restrictions that was completed in September 2018.

- **Environmental Oversight of Construction and Redevelopment**

  Consistent with past practices, environmental oversight was provided for intrusive construction or redevelopment activities where the potential to encounter impacted material was present. Since the previous five-year review was completed, oversight was provided for the following:
  - Installation of SCADA poles on the substation property; and
  - Installation of electrical equipment on Charlotte Street.

  In addition, abandonment of wells and injectors was completed on the adjacent Rabin's property to support redevelopment.

This section also includes the protectiveness determinations and statements from the previous FYR as well as the recommendations from the previous FYR and the status of those recommendations.

Table 6: Protectiveness Determinations/Statements from the 2014 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	The remedy at the Site currently protects human health and the environment. Contaminated soils and source areas were removed in eight phases from 1998 to 2004. Excavated areas were backfilled with clean fill (and chemical oxidants as needed). The remedial action for sediment capping was completed in June 2013. Groundwater results from OU1 and OU2 were generally consistent and within historical ranges or trending down. DNAPL removal data indicates that the volume of DNAPL is being depleted. Sentinel wells do not indicate plume migration. For the remedy to be protective over the long term, institutional controls governing groundwater should be placed on the substation property and considered for other areas of the site where contaminated groundwater is present.

Table 7: Status of Recommendations from the 2014 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1 and 2	There are no institutional controls in place to prevent access to contaminated groundwater.	Institutional controls governing groundwater need to be addressed on the SCE&G substation and should be considered for the other areas of the	Completed	Institutional controls were implemented for the SCE&G property via a Declaration of Covenants and Restrictions. City ordinance 2010-110, § 1, 7-20-10 acts as a groundwater	9/11/2018

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
		site where contaminated groundwater is present.		institutional control for properties outside of the substation property.	

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was made available by a newspaper posting in *The Post and Courier*, on 5/19/2019 (Appendix E). It stated that the FYR was underway and invited the public to submit any comments to the EPA. The results of the review and the report will be made available at the Site's information repository, Charleston County Main Library, located at 68 Calhoun Street, Charleston.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. The interviews are summarized below and included in full in Appendix F.

EPA RPM Ken Mallary stated that current remedy of DNAPL removal and groundwater monitoring is effective and well-suited for the contaminants at the Site. He said he was comfortable with the status of institutional controls at the Site and had not heard any complaints or inquiries regarding site-related environmental issues. Joel Padgett (SCDHEC) stated that the pumping, injections and phytoremediation are effective in removing DNAPL and reducing groundwater contamination. He said the contractor keeps the recovery system and monitoring well network in good condition. SCDHEC received several inquiries and provided relevant information in the past five years; these inquiries came from journalists and from a contractor interested in selling a vacant parcel of land south of the substation. In January 2019, SCDHEC suggested that the contractor distinguish between groundwater contaminants that were below laboratory reporting levels and those that were below laboratory minimum detection levels or non-detect to better define the downgradient edge of the groundwater plume. Mr. Padgett also noted that the former Ansonborough Homes property has been redeveloped under SCDHEC's Voluntary Cleanup Program.

Tom Effinger (SCE&G/SCANA) stated that SCE&G has and continues to remediate various site media while maintaining the safe operation of a critically important electrical substation. He noted that integrating site remediation with redevelopment allowed remediation during other construction activities, which supported property improvements for the surrounding community. Mr. Effinger said the completed and ongoing remedial activities continue to be protective of the environment, practical (given site limitations), and cost-effective. He said that DNAPL continues to be removed and elevated groundwater constituents continue to attenuate as a result. He also noted that optimization for the shallow and intermediate groundwater monitoring and reporting and routine monthly reports is appropriate.

Rusty Contrael (Ace, Inc.), shared that he thinks cleanup was completed to the maximum extent practicable given the logistical and geological challenges encountered at this Site. He stated that the remedy is functioning as intended, DNAPL and contaminated groundwater are not migrating, and O&M activities continue to be efficient and cost-effective. He also shared that recently, with agency approval, the shallow groundwater monitoring program was reduced to an annual event from a 9-month sampling

interval. He suggested that a program should be initiated to properly abandon various non-essential groundwater monitoring wells at the Site.

Data Review

The data collected during this FYR period include DNAPL recovery volumes and shallow and intermediate groundwater monitoring. This part of the FYR summarizes the more detailed data review located in Appendix I.

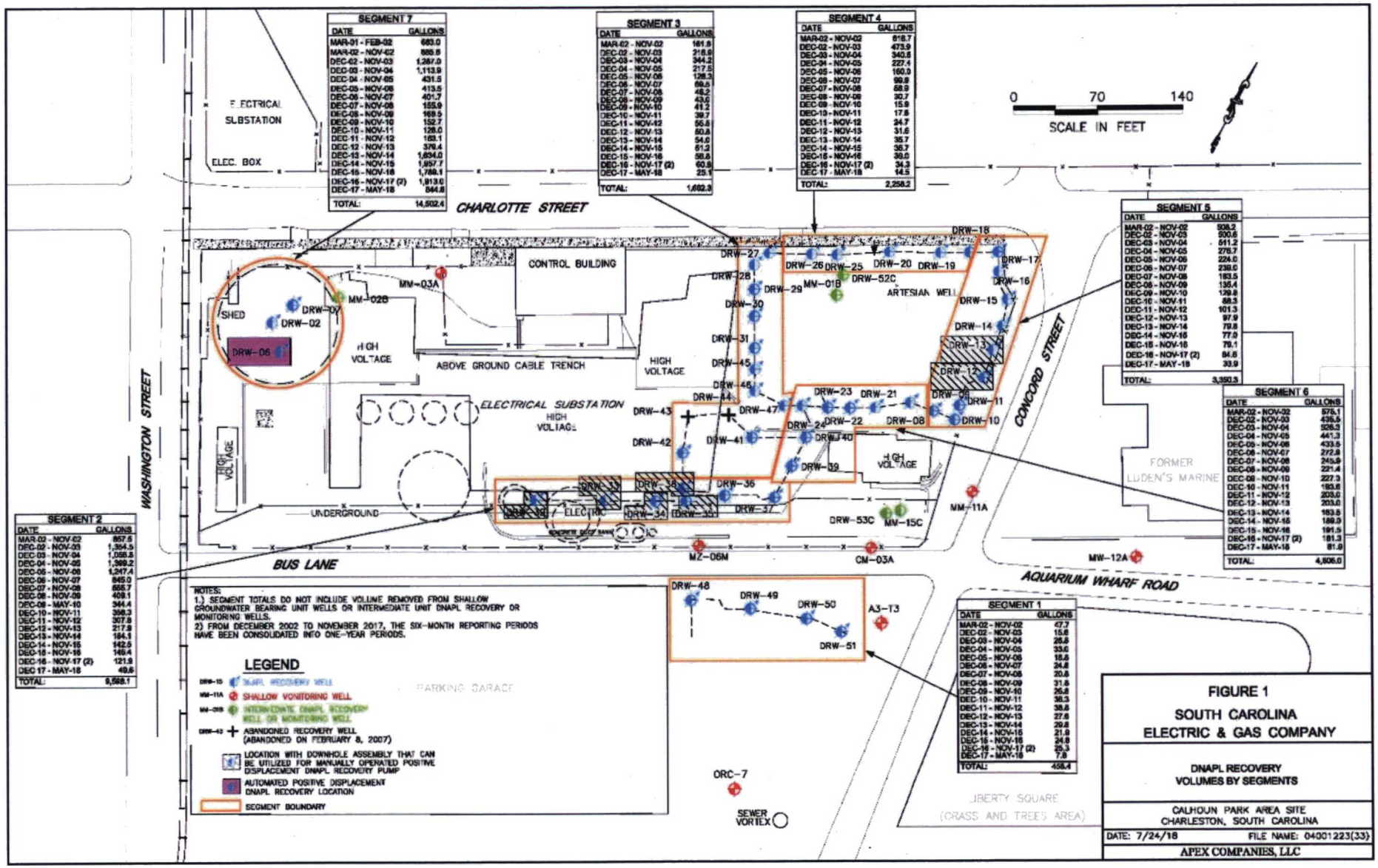
DNAPL Recovery

Manual DNAPL extraction continues to remove DNAPL from the subsurface. A total of 38,347 gallons of DNAPL have been removed from October 1998 to May 2018. Removal occurs via DNAPL recovery wells located in the collection trenches, automated recovery from DRW-06 located in the former gas holder, and recovery from groundwater monitoring wells and other DRW wells where DNAPL typically accumulates.[7]

The DNAPL trench, recovery wells, recovery segments, and recovery volumes by segment are included in Figure 4. Over the last five years, the highest volumes of DNAPL recovered were from segment 7 (Table I-1 in Appendix I). Segment 7 includes DRW-06, which is in the former gas holder, a main DNAPL source area that cannot be excavated. Starting in 2014, the recovered DNAPL volume has increased an order of magnitude in segment 7 (Figure 4). The DNAPL volume recovered from segment 1 has remained relatively stable since recovery began. Except for segments 1 and 7, the DNAPL volumes recovered indicate a downward trend when comparing this FYR period's volumes to historical data (Table I-1 in Appendix I and Figure 4).

[7] The bottom of the former gasholder is on clay that is believed to provide a low hydraulic conductivity layer.

Figure 4: DNAPL Recovery Volumes by Segments[8]



[8] Source: Figure 1 of the 2018 33rd DNAPL Removal Report.

Shallow Groundwater

Shallow groundwater is monitored to assess the restoration of the aquifer and evaluate the potential for contaminant migration. Currently, 13 monitoring wells (five sentinel and eight aqueous plume) are sampled during each monitoring event (Figure 5). Since December 2007, sampling was performed every 9 months to account for seasonal variation. Recently, regulatory agencies approved reducing the shallow groundwater monitoring frequency to annual sampling. The sampling events include groundwater level and DNAPL occurrence measurements. Groundwater samples are analyzed for benzene, toluene, ethylbenzene and xylene (BTEX), semivolatile organic compounds (SVOCs) comprised of PAHs, carbazole and 2,4-dimethylphenol, and cyanide. While included as groundwater COCs in the OU1 ROD, the following inorganics are no longer sampled: nickel, beryllium, lead, mercury, chromium, copper and arsenic. EPA approved the removal of those inorganic constituents from required sampling in a previous technical memorandum. Shallow groundwater flow is shown on Figure I-1 in Appendix I. In the June 2018 Shallow Groundwater Monitoring Report, benzene and naphthalene are used as indicator parameters to assess trends over time to evaluate remedial effectiveness and/or natural attenuation because both are common manufactured gas plant constituents. The historical benzene and naphthalene analytical results are provided in Appendix I in Figures I-2 to I-5. Shallow groundwater monitoring data from this FYR period are included in Figures I-9 and I-10 in Appendix I. General trends from this FYR period are summarized below by well type.

Sentinel Wells

The sentinel wells at the Site monitor the potential for contaminant migration. These wells are located on the eastern part of the Site next to the Cooper River (LM-10AR, LM-03A and MW-07AR), southeast of the former wood treater (MW-33) and northwest of the former gas holder (DW-04) (see Figure 5). The only exceedances of cleanup goals in sentinel wells in this FYR period occurred in well LM-10AR; these are included in Table I-2 in Appendix I. Based on historical data, these exceedances appear to be a more recent phenomenon, with exceedances and non-detections occurring without a clear trend in the past 8 years. The September 2017 exceedances were historic highs for these contaminants in LM-10AR. There have also been low level SVOC detections in LM-10AR. These exceedances and detections may be due to the reoccurring or continued presence of DNAPL in this well. In addition, the detection limit for benzo(a)pyrene of 10 µg/L is above the cleanup goal of 0.2 µg/L and warrants evaluating whether it can be lowered.

With the exception of LM-10AR, the sentinel well results indicate that groundwater contamination is not migrating off site. COC concentrations and DNAPL at well LM-10AR will continue to be closely monitored. If COC concentrations continue to increase, or if DNAPL thickness increases at well LM-10AR, further evaluation of that area may be warranted. While there are several off-site wells with contamination, these have historically been contaminated and do not indicate recent migration.

Aqueous Plume Wells

The aqueous plume wells monitor contamination trends in the shallow aquifer. These wells are located near the former gas holder on the substation property (MZ-02AR, MM-02A and MM-03A), near the former steam power plant/Luden's Marine (LM-02A and LM-01AR) and near the former oil/water separator discharge (MRW-01, MRW-02 and MW-14). Since 2014, benzene was not detected in three of the eight aqueous plume wells. Benzene cleanup goal exceedances in the other aqueous plume wells are summarized in Table I-3 in Appendix I. The highest benzene exceedance in the previous five years was in well MM-03A with a concentration of 3,440 µg/L. Concentrations fluctuated by up to two orders of

magnitude during this FYR period, which is consistent with historical data (See Figure I-3 in Appendix I).

Since 2014, naphthalene was not detected in samples from five of the eight aqueous plume wells. Naphthalene was detected but did not exceed the cleanup goal in wells LM-01AR and MRW-01. The only naphthalene exceedance in the last five years was observed in well MM-03A with a concentration of 3,190 µg/L, above its cleanup goal of 1,500 µg/L (Table I-4). As seen in Table I-4 and in Figure I-5 in Appendix I, naphthalene concentrations fluctuated during this FYR period at MM-03A.

Over the past five years the highest cumulative BTEX concentrations have generally been detected in wells MRW-01, MM-03A and LM-01AR. The highest cumulative SVOC concentrations were observed in wells MRW-01, MM-03A, LM-01AR and MM-14.

Cyanide has been detected above the 0.2 milligram per liter (mg/L) cleanup goal in every monitoring event in this FYR period except for March 2016. These exceedances have generally occurred in wells LM-01AR and MM-03A, with one exceedance in MZ-02AR in December 2016.

In the June 2018 Shallow Groundwater Monitoring Report, SCE&G recommended several optimization modifications to the monitoring program; these are discussed in more detail in Question A of this FYR.

Intermediate Groundwater

The current intermediate groundwater monitoring program was developed to provide data to demonstrate the long-term effectiveness of the in-situ chemical oxidation treatment areas and plume stability via natural attenuation processes at other areas of the Site. The OU2 ROD estimated that based on in situ treatment benefits, the total duration of intermediate groundwater monitoring would be 12 years, which has now been exceeded (injections occurred in 2005 and 2006, which is 13 to 14 years ago). Groundwater samples were collected from 13 to 17 (depending on the event) intermediate monitoring wells during this FYR period (Figure 5). The intermediate sand unit is split into upper, middle and lower sections. Groundwater is sampled every 9 months and analyzed for BTEX and SVOCs. The SVOCs consist of 2,4-dimethylphenol and carbazole and two PAHs, specifically naphthalene and benzo(a)pyrene. Intermediate groundwater flow is shown on Figure I-14 in Appendix I. See Figures I-6 through I-8 in Appendix I for historical benzene and naphthalene results in the upper, middle and lower intermediate sand units relative to the in-situ chemical oxidation treatment areas. Intermediate groundwater monitoring data from this FYR period are included in Figures I-11 to I-13 in Appendix I.

Upper Intermediate Sand Unit

Chemical oxidant injections occurred in the upper intermediate sand unit near wells PAMW-02, BM-08B and BM-03D, which are north, northwest and west of the former gas holder. In this unit, exceedances of benzene, ethylbenzene and naphthalene occurred far above their respective cleanup goals in every sampling event this FYR period. Carbazole was detected above its cleanup goal once during this FYR period (in June 2014).

In well BM-08B, concentrations of benzene and naphthalene have decreased from the historical highs prior to injections. In well PAMW-02, benzene concentrations in this FYR period have fluctuated between non-detect and 906 µg/L in March 2018, the highest benzene concentration observed in this well since 2010.

In well BM-03D, concentrations of benzene have decreased since treatment and have continued to slightly decline in this FYR period. However, concentrations remain well above the benzene cleanup goal of 5 µg/L. Naphthalene concentrations in well BM-03D are near and in some instances above pre-injection concentrations and above the cleanup goal.

Naphthalene concentrations in monitoring wells BM-04D and MM-13C and benzene concentrations in BM-04D appear consistent with pre-injection concentrations and do not demonstrate a clear trend in this FYR period (Table I-5). Benzene concentrations in this FYR period in MM-13C are below the pre-injection concentrations but still exceed the cleanup goal and have fluctuated.

Middle Intermediate Sand Unit
Chemical oxidant injections occurred in the middle intermediate sand unit near wells LM-09B (on the Luden's property), PM-01C, BM-08B,[9] BM-10C (north/northwest/west of the substation) and CM-11D (on the former wood treating property).

Historically and during this FYR period, LM-08C and NM-06D (the middle intermediate sand unit wells closest to the river) have had non-detect concentrations for benzene and naphthalene. This indicates contamination in this aquifer is not migrating.

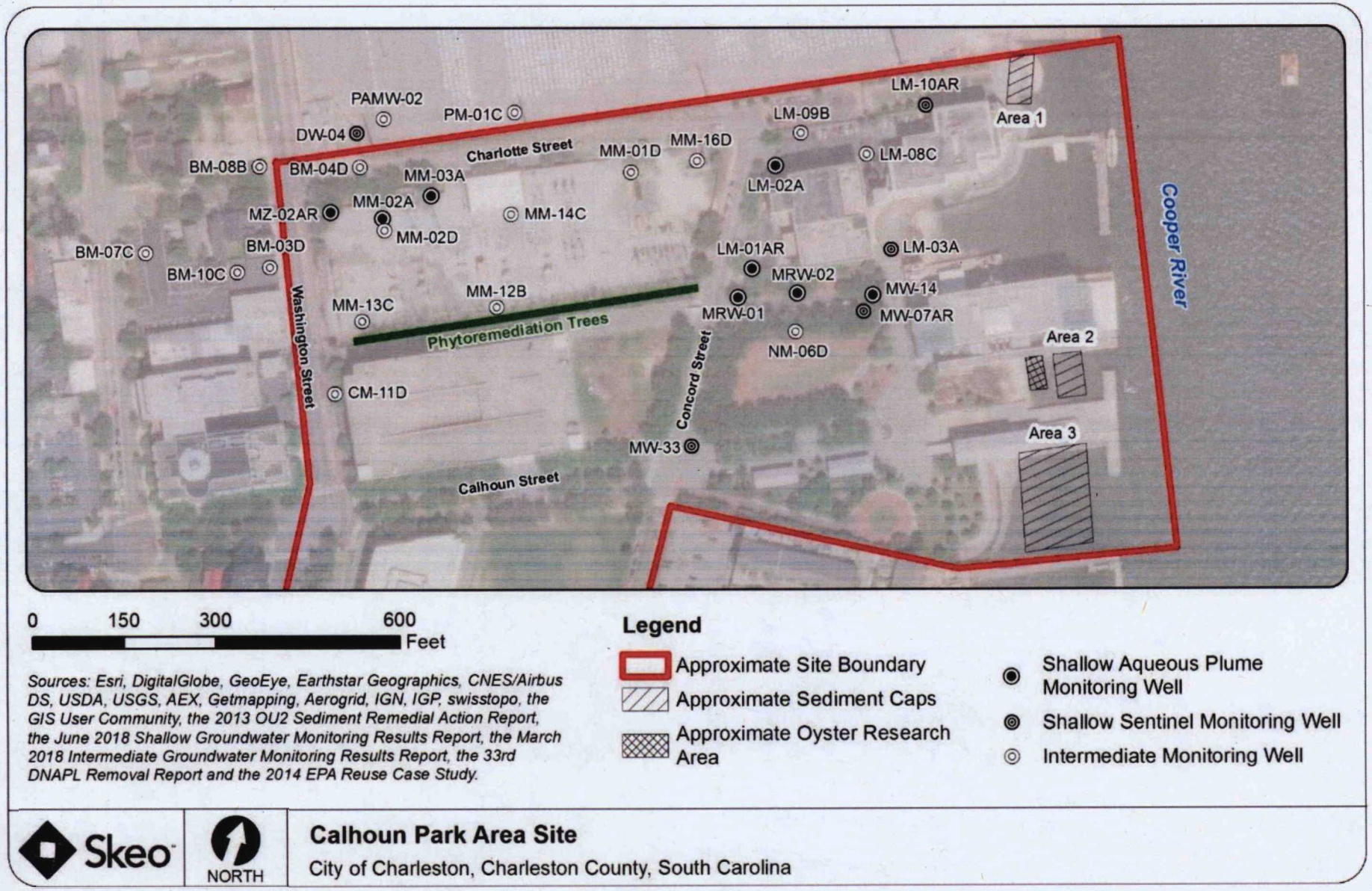
Benzene exceedances have been consistent in wells MM-02D, PM-01C, MM-12B and BM-10C in this FYR period (Table I-6). MM-02D consistently had the highest benzene concentrations; this well is near the former gasholder and is in a natural attenuation area (i.e., this area did not receive bioremediation treatment), both of which may contribute to the higher concentrations found in this well.

Injections near CM-11D and LM-09B appeared effective and reduced concentrations to non-detect or very low detections (Table I-6). These wells were removed from the monitoring program due to this history. Naphthalene in well PM-01C has decreased since the injection and is now primarily not detected. Benzene during this FYR period in PM-01C shows a decreasing trend, but some concentrations exceed pre-injection concentrations; this injection does not appear to have successfully reduced benzene concentrations. Benzene and naphthalene concentrations in BM-10C trended downward following injections but have begun to increase since 2013; these increased concentrations are still below pre-treatment concentrations.

Lower Intermediate Sand Unit
In the lower intermediate sand unit, benzene was the only contaminant to exceed its cleanup goal of 5 µg/L during this FYR period. It was detected in wells MM-01D and MM-16D at concentrations far below the other intermediate units, and concentrations indicate a downward trend in the last five years. In MM-16D, benzene was detected at 110 µg/L in May 2014 and 16 µg/L in March 2018. In MM-01D, benzene was detected at 150 µg/L in May 2014 and was not detected in March 2018.

[9] Well BM-08B is in the upper intermediate sand unit but is used in this context to indicate the location of the injection because there is no middle intermediate well there.

Figure 5: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Site Inspection

The site inspection took place on 12/18/2018. Participants included EPA RPM Ken Mallary, Joel Padgett and Sara MacDonald with SCDHEC, Tom Effinger and Paul Biery with SCE&G, Rusty Contrael with Ace, Inc., and Melissa Oakley and Kelly MacDonald with Skeo. The purpose of the inspection was to assess the protectiveness of the remedy. The participants met at the SCE&G electrical substation and began with an overview of the Site's history and current status. The group then toured the Site, inspecting the active DNAPL pumps, recovery wells, DNAPL collection drums and monitoring wells, which all appeared to be in good condition. The phytoremediation trees line the substation to the south and appeared healthy during the inspection. The substation is fenced, and access is restricted. Site inspection participants then toured the rest of the Site, which included monitoring wells and several areas that have been redeveloped (the South Carolina Aquarium and parking garage, Liberty Square, the Fort Sumter NPS property and several commercial buildings). The participants also visited the three sediment caps. The Area 1 cap is covered by an observation platform at the Charlotte Street Park. Participants were able to see the oyster habitat area near the Area 2 cap and some of the concrete mats on the Area 3 cap. The site inspection checklist and photographs are included in Appendices G and H, respectively.

Skeo staff visited the site's repository; the following documents were available: OU2 RA Work Plan Volume 1, OU2 RA Work Plan Volume 2, June 2004 OU1 Shallow Groundwater Monitoring Results, and the administrative record of maps and oversized documents. No recent documents were available.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

The remedy is functioning as intended by the decision documents. About 63,400 tons of contaminated soil, sediment, coal tar and debris were excavated and disposed of off site. A large amount of DNAPL was removed during the soil remediation. DNAPL removal is ongoing via a recovery system. Bioremediation was conducted by amending excavation backfill material and by conducting injections. During the soil excavation, contaminated water was removed and treated. Phytoremediation was implemented by USGS by planting trees near the substation and is ongoing as trees uptake contaminated groundwater. Three sediment caps are in place to prevent ecological exposure to contaminated sediments.

DNAPL recovery began in 1998 and is ongoing. Compared to historic data, the volumes of recovered DNAPL have decreased in segments 2 through 6, remained stable in segment 1 and increased in segment 7. There was a spike in volume recovered in segment 7 beginning in 2014; recovery volumes in segment 7 now exceed volumes from the startup of DNAPL recovery. Segment 7 includes well DRW-06 in the former gas holder source area.

Shallow sentinel well monitoring results indicate that the groundwater contamination does not appear to be migrating beyond the sentinel wells, except for LM-10AR. COC concentrations and DNAPL at well LM-10AR will continue to be closely monitored. If COC concentrations continue to increase, or if DNAPL thickness increases at well LM-10AR, further evaluation of that area may be warranted.

Naphthalene, benzene and other contaminant concentrations are above cleanup goals in several areas of the Site in both the shallow and intermediate aquifers. Some concentrations are increasing or fluctuating by more than two orders of magnitude. In addition, the OU2 ROD estimated that intermediate groundwater monitoring would be needed for 12 years based on the expected effects of in situ treatment. Injections occurred in 2005 and 2006 (13 to 14 years ago), and some intermediate wells are still not trending downward (i.e., groundwater monitoring is still needed at this time).

The remedy is taking longer than anticipated. DNAPL removal volumes are increasing in DRW-06. There is also a lack of clear decreasing trends in some shallow groundwater aqueous plume monitoring wells and increasing DNAPL and contaminant trends in shallow groundwater sentinel well LM-10AR. Results of injections are also mixed in the intermediate aquifer. The PRP is aware of these issues and is actively looking for ways to improve remedy performance. The PRP also routinely makes system adjustments to improve DNAPL recovery.

SCE&G has recommended optimizations to the shallow and intermediate groundwater monitoring programs. The EPA and SCDHEC will determine if these changes are appropriate.

An institutional control is in place for the SCE&G property, which includes groundwater and land use restrictions. Part of the Charleston City Code (Ord. No. 2010-110, § 1, 7-20-10) acts as an institutional control for groundwater outside of the substation property. Institutional controls are not needed for soil at properties outside of the SCE&G substation property because soil cleanup has been completed and the soil PRGs are protective of a residential exposure scenario (Appendix K). Contamination remains in place under capped sediment areas, but decision documents do not require institutional controls to ensure the long-term integrity of sediment caps. Implementation of conventional institutional controls on riparian properties presents a wide range of challenges and is often deemed infeasible. In order to ensure the continued integrity of the caps, the PRP visually inspects the sediment caps during routine O&M activities. As the caps are located within a public waterway, no work of any kind can be performed in those areas without first obtaining prior permission and required permits from several regulatory agencies. That requirement acts as an institutional control that prevents activities that could potentially impact the integrity of the caps. The OU2 ROD called for institutional controls to restrict future use of intermediate groundwater on the SCE&G property; however, decision documents did not call for institutional controls for the substation property soil, for contaminated groundwater outside of the substation property or for the sediment caps. While institutional controls are in place for those areas, this FYR recommends that the need for those institutional controls be formally documented.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection still valid?

Question B Summary:

Groundwater cleanup goals based on Applicable or Relevant and Appropriate Requirements (ARARs) were reviewed as part of this FYR to determine if any ARAR values have changed since issuance of decision documents. The full evaluation is included in Table J-1 of Appendix J and indicates that the only MCL that has changed is arsenic, which was removed from the COC list in 2002. Therefore, all of the Site's ARAR-based cleanup goals remain protective.

Groundwater cleanup goals that were health-based rather than ARAR-based were also reviewed as part of this FYR. These groundwater cleanup goals were compared to current Regional Screening Levels (RSLs) to see if they remain valid. RSLs incorporate current toxicity values and standard default exposure factors. The full evaluation is included in Table K-1 of Appendix K and indicates that the health-based cleanup goals remain valid except for the noncancer risk from 2,4-dimethylphenol and the noncancer and cancer risk from naphthalene. Tap water RSLs are conservative screening levels for drinking water, and the groundwater at the Site is not used for drinking; therefore, this does not affect current protectiveness. However, the cleanup goals for naphthalene and 2,4-dimethylphenol do not correspond to risks within the EPA's acceptable risk range; the EPA may consider reevaluating these cleanup goals to determine if they warrant updating.

The June 2018 Shallow Groundwater Monitoring Report notes that the chrysene cleanup goal was changed from the 1998 OU1 ROD's value of 20 µg/L to 200 µg/L; this change was approved in a SCDHEC letter dated May 23, 2002. This cleanup goal change does not appear to have been documented in a formal EPA document. During this FYR period, chrysene was typically not detected. Sporadic detections ranged from 19 to 30 µg/L, near the ROD cleanup goal and well below the recent SCDHEC-approved cleanup goal. Therefore, this cleanup goal change does not affect current protectiveness. The EPA may consider formalizing the cleanup goal change.

The detection limit for benzo(a)pyrene of 10 µg/L is above the groundwater cleanup goal of 0.2 µg/L. In this FYR period, benzo(a)pyrene has been detected in sentinel well LM-10AR above the detection limit. The PRP should evaluate whether the detection limit can be lowered to assess achievement of the cleanup goal.

Soil PRGs were based on risk rather than chemical-specific ARARs. As part of this FYR, soil PRGs were compared to current RSLs to see if the PRGs remain valid. The full evaluation is included in Tables K-3 and K-4 of Appendix K and indicates that PRGs remain valid. The ecological-based sediment cleanup goals were reviewed and determined to be valid based on a comparison to current guidance levels (Appendix K, Table K-5).

Because VOCs are present in shallow groundwater at the Site, this FYR conducted a screening-level evaluation to determine whether there may be unacceptable risks from the vapor intrusion pathway. The screening-level vapor intrusion evaluation was performed using a commercial exposure scenario and the most recent shallow groundwater data from June 2018. The evaluation indicated that vapor intrusion risks are currently within or below the EPA's target risk ranges.; The full evaluation is included in Table K-2 of Appendix K. While the Vapor Intrusion Screening Level (VISL) evaluation considered concentrations from June 2018, there is a seasonal trend at well MM-03A (near the SCE&G control building) in which concentrations are highest in December. However, as noted in the Site's 2009 Assessment of Vapor Intrusion report (Technical Memorandum #004), the control building houses electrical equipment and is highly ventilated to maintain appropriate operating temperatures. The building is also not occupied on a full-time basis but is used intermittently to perform required maintenance and monitoring tasks. Therefore, the vapor intrusion pathway does not currently present unacceptable risk at the Site.

The RAOs used at the time of remedy selection remain valid.

QUESTION C: Has any other information come to light that could call into question the protectiveness

of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
None.

Issues and Recommendations Identified in the FYR:

OU(s): 1 and 2	: Remedy Performance			
	Recommendation:			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	8/22/2021

OU(s): 1 and 2	**Issue Category:** Monitoring			
	Issue: The groundwater cleanup goals for naphthalene and 2,4-dimethylphenol do not correspond to risks within the EPA's acceptable risk range.			
	Recommendation: Evaluate whether naphthalene and 2,4-dimethylphenol groundwater cleanup goals warrant updating to reflect appropriate risk levels.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	8/22/2021

OU(s): 1	**Issue Category:** Monitoring			
	Issue: The chrysene cleanup goal was changed from the 1998 OU1 ROD's value of 20 µg/L to 200 µg/L; this was approved in a 2002 SCDHEC letter. This cleanup goal change does not appear to have been documented in a formal EPA document.			
	Recommendation: Evaluate whether the new chrysene groundwater cleanup goal should be updated in a decision document.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	8/22/2021

OU(s): 2	: Institutional Controls			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	8/22/2021

OU(s): 1	: Institutional Controls			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	8/22/2021

OU(s): 1 and 2	**Issue Category:** Institutional Controls			
	Issue: There is no remedial requirement for institutional controls for the substation property soil, for site-related groundwater contamination outside of the substation property or for the sediment caps.			
	Recommendation: Officially document the need for institutional controls for the substation property soil, for site-related groundwater contamination outside of the substation property and for the sediment caps.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	8/22/2021

OU(s): 1 and 2	**Issue Category:** Monitoring			
	Issue: The detection limit used for benzo(a)pyrene is above its established groundwater cleanup goal.			
	Recommendation: Ensure the detection limit is low enough to assess achievement of the benzo(a)pyrene groundwater cleanup goal.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	8/22/2021

OTHER FINDINGS

Several additional recommendations were identified during the FYR. These recommendations do not affect current and/or future protectiveness.

- Update the site repository with recent documents.
- In groundwater monitoring reports, clearly distinguish between groundwater contaminant concentrations that are below laboratory reporting levels and those that were below laboratory minimum detection levels or "non-detect".
- Continue to closely monitor COC concentrations and DNAPL at sentinel well LM-10AR. If COC concentrations continue to increase, or if DNAPL increases at well LM-10AR, additional evaluation of that area may be warranted.
- Consider groundwater monitoring program optimization suggestions from SCE&G.
- Consider mapping plumes in groundwater monitoring reports.
- Consider formally documenting the decision to remove nickel, beryllium, lead, mercury, chromium, copper and arsenic from the list of shallow groundwater COCs.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement	
Operable Unit: 1	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement: The remedy at OU1 currently protects human health and the environment because contaminated soil was excavated and disposed of off-site, DNAPL was removed during excavation and continues to be removed via ongoing DNAPL recovery, shallow groundwater monitoring and phytoremediation are ongoing, bioremediation products were put in backfill and injected into the subsurface, and institutional controls are in place to prevent exposure to contaminated groundwater. However, in order for the remedy to be protective over the long-term, the following action needs to be taken:

- Evaluate whether naphthalene and 2,4-dimethylphenol groundwater cleanup goals warrant updating to reflect appropriate risk levels.
- Evaluate whether the new chrysene groundwater cleanup goal should be updated in a decision document.
- Officially document the need for institutional controls for the substation property soil, for site-related groundwater contamination outside of the substation property and for the sediment caps.
- Ensure the detection limit is low enough to assess achievement of the benzo(a)pyrene groundwater cleanup goal.

Protectiveness Statement	
Operable Unit: 2	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement: The remedy at OU2 currently protects human health and the environment because contaminated sediment was capped, intermediate groundwater monitoring is ongoing, bioremediation products were put in backfill and injected into the subsurface, and institutional controls are in place to prevent exposure to contaminated groundwater, ensure the long-term integrity of the sediment caps and to prohibit activities that could potentially disturb the caps. However, in order for the remedy to be protective over the long-term, the following action needs to be taken:

- Evaluate whether naphthalene and 2,4-dimethylphenol groundwater cleanup goals warrant updating to reflect appropriate risk levels.
- Officially document the need for institutional controls for the substation property soil, for

site-related groundwater contamination outside of the substation property and for the sediment caps. Ensure the detection limit is low enough to assess achievement of the benzo(a)pyrene groundwater cleanup goal.

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: Because the remedies for OU1 and OU2 are protective in the short term, the sitewide remedy is protective in the short term. For the sitewide remedy to be protective over the long term, the issues identified for OU1 and OU2 need to be addressed.

VIII. NEXT REVIEW

The next FYR Report for the Calhoun Park Area site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Explanation of Significant Differences. EPA. Calhoun Park Area Site, Charleston, South Carolina. November 2005.

Interim Remedial Action Report, OU1. Management and Technical Resources, Inc. Calhoun Park Area Site, Charleston, South Carolina. August 2006.

Intermediate Groundwater Analytical Results – June 2014. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. September 2014.

Intermediate Groundwater Analytical Results – March 2015. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. July 2015.

Intermediate Groundwater Analytical Results – December 2015. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. March 2016.

Intermediate Groundwater Analytical Results – September 2016. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. April 2017.

Intermediate Groundwater Analytical Results – June 2017. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. August 2017.

Intermediate Groundwater Analytical Results – March 2018. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. July 2018.

Record of Decision, OU1. EPA. Calhoun Park Area Site, Charleston, South Carolina. September 1998.

Record of Decision, OU2. EPA. Calhoun Park Area Site, Charleston, South Carolina. September 2002.

Remedial Action Report, OU2. Areas 1, 2 and 3 Sediments. Management and Technical Resources, Inc. Calhoun Park Area Site, Charleston, South Carolina. November 2013.

Remedial Action Report, OU2. Intermediate Groundwater. Management and Technical Resources, Inc. Calhoun Park Area Site, Charleston, South Carolina. June 2007.

Second Five-Year Review Report. Operable Units 1 and 2. EPA. Calhoun Park Area Site, Charleston, South Carolina. August 2014.

Shallow Groundwater Analytical Results – September 2014. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. February 2015.

Shallow Groundwater Analytical Results – June 2015. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. November 2015.

Shallow Groundwater Analytical Results – March 2016. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. June 2016.

Shallow Groundwater Analytical Results – December 2016. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. May 2017.

Shallow Groundwater Analytical Results – September 2017. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. February 2018.

Shallow Groundwater Analytical Results – June 2018. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. October 2018.

Technical Memorandum #004 – Assessment of Vapor Intrusion. Management & Technical Resources, Inc. Calhoun Park Area Site, Charleston, South Carolina. February 2009.

Thirty-Third DNAPL Removal Report. December 2017 through May 2018. SCE&G. Calhoun Park Area Site, Charleston, South Carolina. October 2018.

APPENDIX B – CURRENT SITE STATUS

Environmental Indicators
- Current human exposures at the Site are under control. *- Current groundwater migration is under control.*

Are Necessary Institutional Controls in Place?
☒ All ☐ Some ☐ None *Institutional controls are in place on the SCE&G substation property for groundwater and soil. Part of the Charleston City Code (Ord. No. 2010-110, § 1, 7-20-10) acts as an institutional control for areas outside of the substation property because it includes a requirement that dwelling structures must have fresh water from a SCDHEC-approved well or from a public water system supplied to the individual building through an on-site water meter. This city ordinance provides protection at the Site by preventing use of contaminated groundwater. In order to ensure the continued integrity of the sediment caps, the PRP visually inspects the caps during routine O&M activities. As the caps are located within a public waterway, no work of any kind can be performed in those areas without first obtaining prior permission and required permits from several regulatory agencies. That requirement acts as an institutional control that prevents activities that could potentially impact the integrity of the caps. While institutional controls are in place, there is no remedial requirement for institutional controls for the substation property soil, non-substation property contaminated groundwater and sediment caps. This FYR recommends the official documentation of the need for institutional controls for those areas.*

Has EPA Designated the Site as Sitewide Ready for Anticipated Use?
☐ Yes ☒ No

Has the Site Been Put into Reuse?
☒ Yes ☐ No

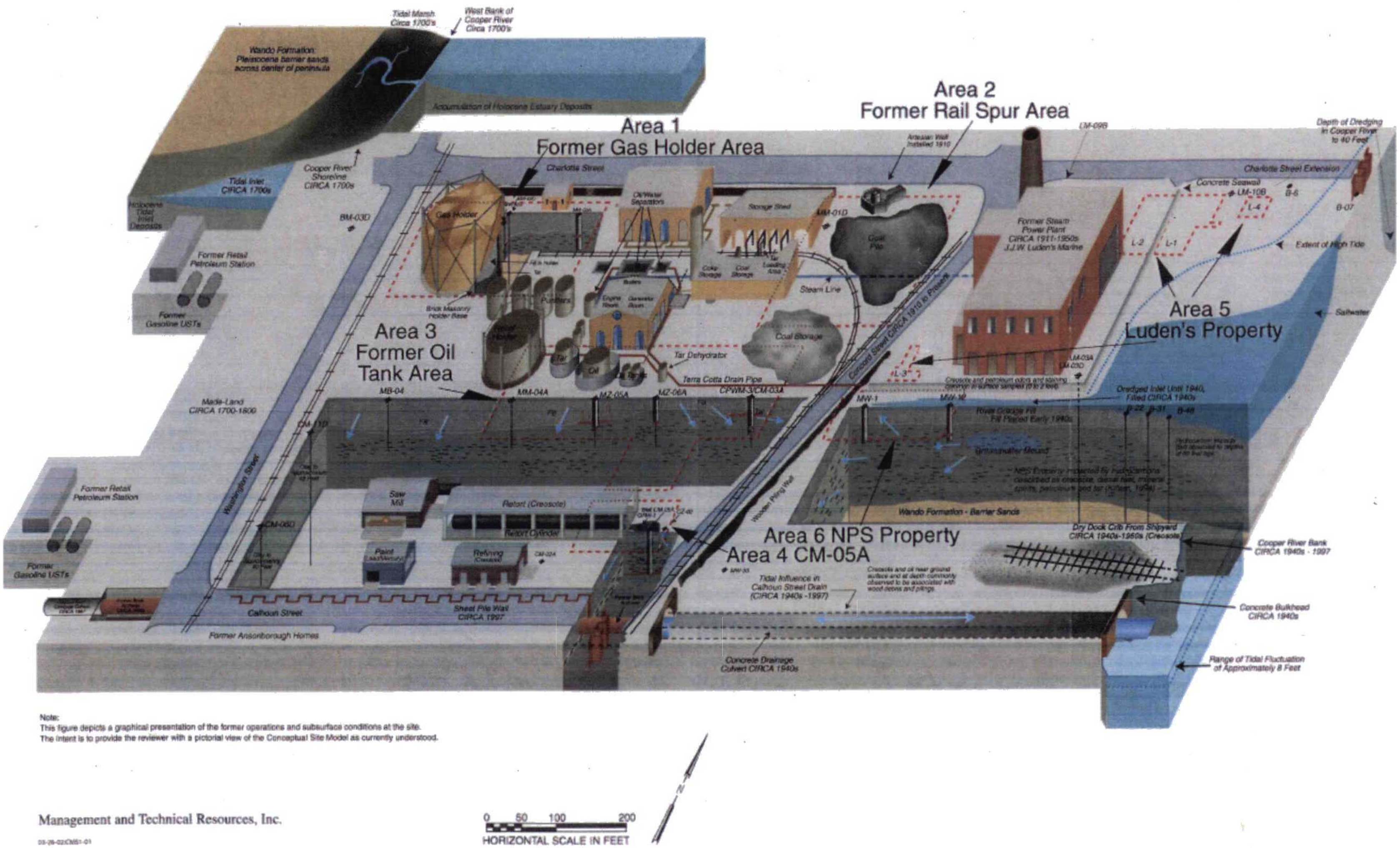
APPENDIX C – SITE CHRONOLOGY

Table C-1: Site Chronology

Event	Date
Manufactured gas plant operated on site	1855 - 1957
Contamination was discovered	May 22, 1991
The EPA conducted the Preliminary Assessment	September 4, 1991
The EPA conducted the Site Inspection	June 24, 1992
SCE&G entered into an Administrative Order with the EPA to perform an RI	January 22, 1993
The EPA approved SCE&G's Removal Action Work Plan	July 22, 1998
SCE&G completed the remedial investigation/feasibility study The EPA issued the OU1 ROD	September 30, 1998
Start of DNAPL removal	October 1998
Unilateral Administrative Order for OU1	January 19, 1999
SCE&G completed source removal activities completed – Phase I through VI	February 1999 – June 2000
SCE&G completed remedial design	July 13, 2000
SCE&G completed phase VII source removal	April 2002
SCE&G completed the RI/FS for OU2	May 9, 2002
The EPA issued the OU2 ROD	September 24, 2002
Unilateral Administrative Order for OU2	September 23, 2003
PRP Remedial Design (OU2) start	October 13, 2003
PRP Remedial Design (OU2 - Sediments) start	March 12, 2004
PRP Remedial Design (OU2 - Sediments) Addendum	August 13, 2004
SCE&G completed phase VIII source removal	December 2004
The EPA issued an ESD for OU1	November 7, 2005
SCE&G completed the OU2 sediment remedial action in Area 2 and Area 3	August 2006
Vapor intrusion Technical Memorandum submitted	February 2009
The EPA signed the first FYR	August 26, 2009
SCE&G completed the OU2 sediment remedial action in Area 1	December 14, 2012
The EPA signed the second FYR	August 22, 2014
Institutional controls implemented for the SCE&G property via a Declaration of Covenants and Restrictions	September 2018

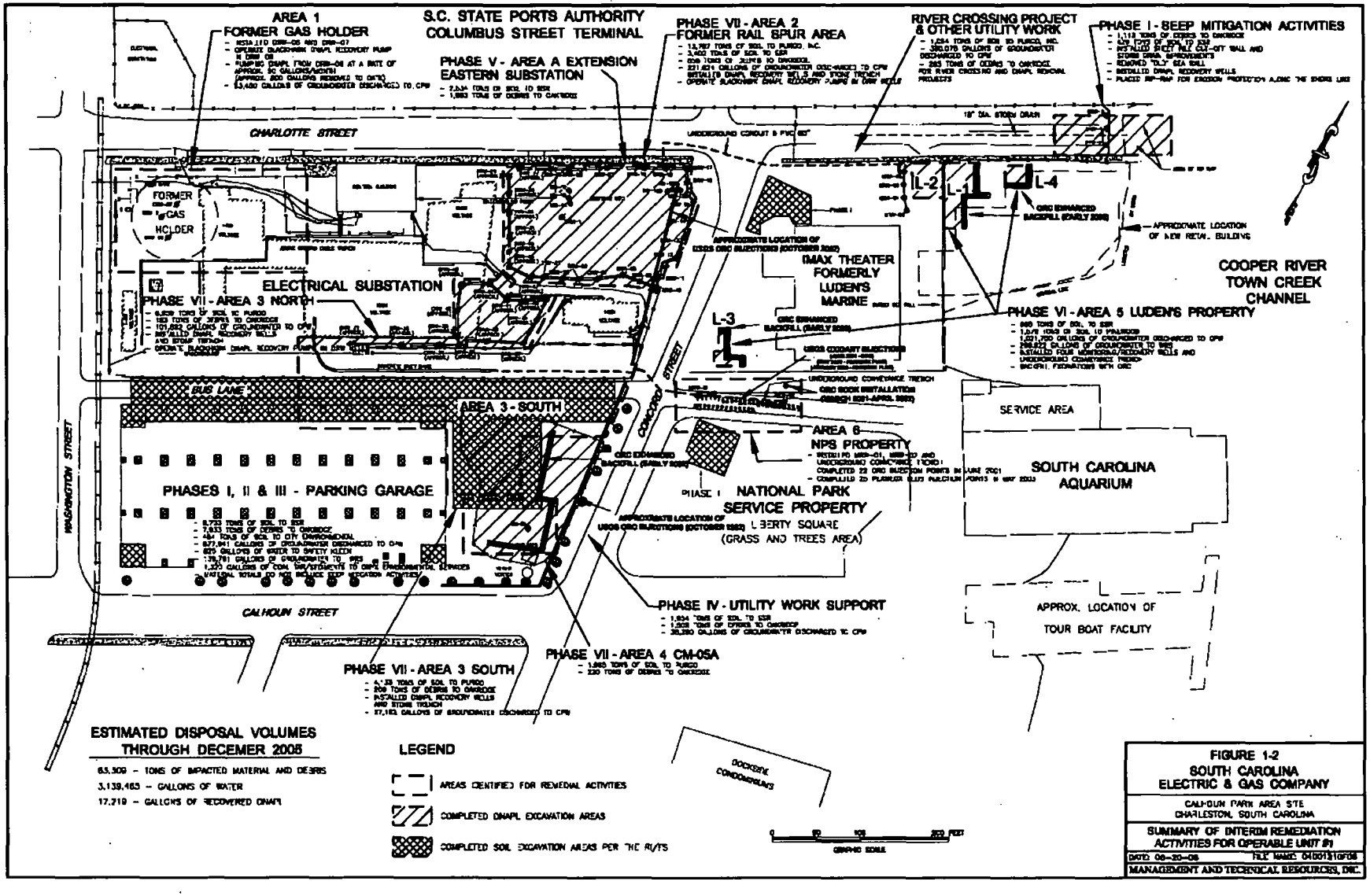
APPENDIX D – SITE MAPS

Figure D-1: Historical Site Map[10]



[10] Source: Management and Technical Resources, Inc.

Figure D-2: Soil and DNAPL Excavation Areas[11]



[11] Source: Figure 1-2 of the 2006 OU1 Interim Remedial Action Report.

APPENDIX E – PRESS NOTICE

The Post and Courier

The U.S. Environmental Protection Agency, Region 4
Announces the Third Five-Year Review for
the Calhoun Park Area Site,
Charleston, Charleston County, South Carolina

Purpose/Objective: The EPA is conducting a Five-Year Review of the remedy for the Calhoun Park Area site (the Site) in Charleston, South Carolina. The purpose of the Five-Year Review is to make sure the selected cleanup actions effectively protect human health and the environment.

Site Background: The Site includes an electrical substation owned by South Carolina Electric and Gas Company (SCE &G), a parking garage, a park, National Park Service facilities and commercial businesses. From 1855 to 1957, a manufactured gas plant (MGP) operated on site. The MGP produced "town gas" by heating coal in the absence of oxygen. Liquid coal tar was a byproduct of this process and is the primary source of site contamination. Facility operations and waste handling practices contaminated soil, sediment and groundwater. The EPA did not list the Site on the Superfund program's National Priorities List (NPL) but considers it an NPL-caliber site and is addressing it through the Superfund Accelerated Cleanup Model.

Cleanup Actions: Before the EPA selected the final site remedies, a sediment containment plan was put in place. It included a sand blanket to minimize resuspension of contaminated sediment, a timber lagging wall to limit discharge of particulates to the subtidal area, and a silt curtain to contain sand from the sand blanket that might be disturbed during construction in the area. For the Site's remedy, the EPA designated two operable units (OUs) to address the contamination. The EPA selected the remedy to treat OU1 (soil, dense non-aqueous phase liquid [DNAPL] and shallow groundwater) in the Site's 1998 Record of Decision (ROD). It included excavation and offsite disposal of contaminated soil, backfilling of excavated areas, DNAPL source area removal, containment of potentially non-restorable source areas, sediment and surface water sampling following mitigation of coal tar discharge to Cooper River, and use of recovery wells, a filtration system, and plants and their microorganisms to break down groundwater contamination.

The EPA updated the OU1 remedy in 2006 with an Explanation of Significant Differences (ESD) to address three additional areas of contamination and to update the cleanup plan to include the use of chemicals to limit the spread of source materials in inaccessible areas, including underground utilities and structures related to the SCE&G electrical substation. The EPA selected the remedy to address OU2 (surface water, intermediate groundwater and sediment in the Cooper River) in the Site's 2002 ROD. It included pumping to remove DNAPL from groundwater, chemical treatment of contaminated groundwater, evaluation of measures to contain DNAPL if needed, groundwater monitoring and groundwater institutional controls. It also requires monitoring and maintenance of capped sediment areas in the Cooper River. The PRP completed cleanup activities for OU1 in 2006 and for OU2 in 2012. The DNAPL recovery system continues to operate. Groundwater monitoring is ongoing.

Five-Year Review Schedule: The National Contingency Plan requires review of remedial actions that result in any hazardous substances, pollutants or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure every five years to ensure the protection of human health and the environment. The third Five-Year Review for the Site will be completed by August 2019.

The EPA Invites Community Participation in the Five-Year Review Process: The EPA is conducting this Five-Year Review to evaluate the effectiveness of the Site's remedy and to ensure that the remedy remains protective of human health and the environment. As part of the Five-Year Review process, EPA staff is available to answer any questions about the Site. Community members who have questions about the Site or the Five-Year Review process, or who would like to participate in a community interview, are asked to contact:

Ken Mallary, EPA Remedial Project Manager
Angela Miller, EPA Community Involvement Coordinator
Phone: (404) 562-8802
Phone: (404) 562-8561 (800) 241-1754 (toll-free)
Email: mallary.ken@epa.gov
Email: miller.angela@epa.gov

Mailing Address: U.S. EPA Region 4, 61 Forsyth Street, S.W., 11th Floor, Atlanta, GA 30303-8960

Additional information is available at the Site's local document repository, Charleston County Main Library, located at 68 Calhoun Street, Charleston, South Carolina, and online at https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0405666.

APPENDIX F – INTERVIEW FORMS

Calhoun Park Area Site **Five-Year Review Interview Form**

Site Name: Calhoun Park Area **EPA ID No.:** SCD987581337

Interviewer Name: _____ **Affiliation:** _____
Subject Name: Ken Mallary **Affiliation:** EPA RPM
Subject Contact Information: work phone # 404-562-8802, email – mallary.ken@epa.gov
Time: 2:12 pm **Date:** 02/28/19
Interview Location: _____

Interview Format (circle one): In Person Phone Mail Other: (Email)

Interview Category: EPA Remedial Project Manager

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The PRP continues to be pro-active in removing NAPL from the source area, as well as monitoring groundwater across the Site. Re-use on portions of the Site were initiated about 20 years ago due to the high demand for property in downtown Charleston.

2. What have been the effects of this Site on the surrounding community, if any?

   I am not aware of any effects of this Site on the surrounding community.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities since the implementation of the cleanup?

   No

4. What is your assessment of the current performance of the remedy in place at the Site?

   I believe the current remedy (NAPL removal) and groundwater monitoring is effective and well-suited for the contaminants at the Site.

5. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   Yes

6. Are you aware of any community concerns regarding the Site or the operation and management of its remedy? If so, please provide details.

   No

7. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   No

8. Do you consent to have your name included along with your responses to this questionnaire in the FYR report?

Yes

Calhoun Park Area Site **Five-Year Review Interview Form**

Site Name: Calhoun Park Area **EPA ID No.:** SCD987581337

Interviewer Name: _____ **Affiliation:** _____

Subject Name: Rusty Contrael **Affiliation:** Ace, Inc.

Subject Contact Information: rcontrael21@outlook.com

Time: _____ **Date:** 2/19/19

Interview Location: _____

Interview Format (circle one): **In Person** **Phone** **Mail** **Other:** (**Email**)

Interview Category: **O&M Contractor**

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   My overall impression of the project is that the cleanup was completed to the maximum extent practicable given the logistical and geological challenges encountered at this Site. The operation and maintenance (O&M) activities continue to be efficient and cost-effective, based largely on the volume of dense, non-aqueous phase liquid (DNAPL) that continues to be recovered. The potential for Site reuse has been maximized. The site was awarded the "Excellence in Site Reuse" from the EPA in 2012.

2. What is your assessment of the current performance of the remedy in place at the Site?

   The remedy is performing as intended and providing sufficient protection of human health and the environment.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

   Based on the on-going DNAPL Monitoring and Recovery Program, DNAPL continues to be recovered to the maximum extent practicable, consistent with the first objective of the Record of Decision (ROD) for the Site. Also, based on the groundwater monitoring programs, DNAPL and impacted groundwater migration is ***not*** *occurring.*

   For the OU #1 shallow zone groundwater, flow patterns are remaining fairly consistent, while benzene and naphthalene concentrations continue to trend downward (with some variation).

   For the OU #2 intermediate zone groundwater, flow patterns are also remaining consistent, while overall, benzene and naphthalene concentrations continue to trend downward (with the noted exception as follows). Two middle intermediate zone wells, located near Washington Street, indicate an apparent increase in some constituent concentrations (benzene and ethylbenzene) based on recent monitoring events. However, the concentrations are within the historical range and the findings also indicate that the overall program is effective and efficient in providing accurate documentation of key trends in contaminant levels. PAH constituents do not have a similar apparent increase in concentrations, suggesting the continuing possibility of a non-MGP source.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

There is a very consistent O&M presence at the Site (i.e., 2 weeks on / 1 week off). The week off provides ample time for DNAPL to accumulate in the subsurface collection/containment system, thereby increasing the efficiency for removal. Staff responsibilities include: DNAPL measurement, maintenance and removal activities from various site-wide locations, maintaining the shallow and intermediate groundwater sampling program, providing support for other intrusive field activities related to the O & M of the electrical substation equipment and maintaining the Site facilities.

Providing support for other intrusive field activities, (i.e. future construction worker protection) was another important objective for the overall remedial approach at the Site. Having established the protocols and procedures for providing environmental support for the installation of new or updated substation equipment allows SCE&G to fulfill its' commitment to continue to provide efficient and reliable electrical service to Charleston and the surrounding community. When future intrusive activities by substation personnel are required, O&M site personnel will typically conduct a health and safety briefing for the electrical workers and any subcontractors that may also be working in the substation. Oversight tasks will also include monitoring the work area and being prepared to appropriately manage any impacted material that may be generated. Routinely providing this support is fully consistent with the intent of the remedy to be protective of "a future construction worker."

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

Yes. Recently, with agency approval, the shallow groundwater monitoring program was reduced to an annual event from a 9-month sampling interval. Additional changes that have resulted in optimization include; sampling the sentinel groundwater monitoring wells every other year and eliminating seven PAH constituents from the parameter list to provide further focus to the monitoring program. These changes will result in cost savings and improved efficiency.

For the intermediate groundwater monitoring program, similar optimizations/reductions may be proposed in the near future.

Also, in July 2010, the schedule for site O&M personnel staffing was reduced to a 2 week on - 1 week off pumping schedule. This reduction in labor has resulted in more DNAPL volume being recovered per pumping event, while reducing labor and overall site costs. The O&M schedule is evaluated on annual basis and has remained the same for this 5-year review period.

The primary objective of the ROD (DNAPL removal to the maximum extent practicable) continues to be achieved. The protectiveness or effectiveness of the remedy has not been adversely affected by these changes.

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

There have been no unexpected O&M difficulties or costs at the Site since start-up or in the last five years.

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

   Yes. As stated above and with agency approval, the shallow groundwater monitoring frequency was reduced to an annual event from a 9-month sampling interval. Additional changes that have resulted in optimization include; sampling the sentinel groundwater monitoring wells every other year and eliminating seven PAH constituents from the parameter list to provide further focus to the monitoring program. These changes will result in cost savings and improved efficiency.

   For the intermediate groundwater monitoring program, similar optimizations/reductions will be proposed in the near future.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

   Yes, I believe that a program should be initiated to properly abandon various non-essential groundwater monitoring wells at the Site. Other changes may be appropriate in the future and will be presented to EPA and SCDHEC if justified, to provide for continuous improvement and optimization of the programs.

9. Do you consent to have your name included along with your responses to this questionnaire in the FYR report?

   Yes

Calhoun Park Area Site **Five-Year Review Interview Form**

Site Name: Calhoun Park Area **EPA ID No.:** SCD987581337

Interviewer Name: _____ **Affiliation:** _____

Subject Name: Tom Effinger **Affiliation:** Dominion Energy, Inc.

Subject Contact Information: TEFFINGER@scana.com

Time: _____ **Date:** 2/25/19

Interview Location: _____

Interview Format (circle one): In Person Phone Mail Other: (Email)

Interview Category: **Potentially Responsible Parties (PRPs)**

1. What is your overall impression of the remedial activities at the Site?

   SCE&G has and continues to work hard to remediate various impacted media at the Site, while maintaining the safe operation of a critically important electrical substation. The on-going site work is being completed with minimal disruption and no adverse impacts to the surrounding community. The completed and on-going remedial activities continue to be protective of the environment, practical (given site limitations), and cost-effective.

2. What have been the effects of this Site on the surrounding community, if any?

   Since the late 1990's, integrating site remediation with redevelopment allowed the remedy to proceed during other project construction activities which in-turn helped support many beneficial property reuse improvements for the surrounding community. Completed Site redevelopment activities include a new parking garage, the South Carolina Aquarium and open green space used for various community events, an office/shopping facility, and the National Park Service's Fort Sumter tour boat facility. The Charlotte Street Park, which includes an observation deck extending over the Cooper River, was completed and future development plans for the site include a museum and other amenities to support the growing local economy and tourism to the area.

3. What is your assessment of the current performance of the remedy in place at the Site?

   The remedy in place at the Site is meeting and achieving the remedial objectives of the Record of Decision (ROD). Dense Non-Aqueous Phase Liquids (DNAPL) continue to be removed from various locations throughout the site and elevated groundwater constituents continue to attenuate as a result. The total DNAPL removed is at or above 40,000 gallons and continues.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   There have been no complaints but there have been several inquiries from various property owners since the implementation of the cleanup, which began in 1998. Currently, SCANA is not aware of any unresolved environmental issues with any residents. Previously, SCANA has worked with a neighboring property to the north and the regulatory agencies to support the potential sale of the property for redevelopment but to our knowledge, the sale did not go forward for reasons unrelated to the site cleanup.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Yes, I am very well informed of the site's activities and remedial progress.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   I believe that the operation of the Site remedy is both protective of the environment and cost-effective. There may be opportunities for improvement in monitoring and reporting since the site has such a long history of data collection and observed positive trends. Optimization is believed to be appropriate for the shallow and intermediate groundwater monitoring and reporting as well as for the routine monthly reports. We are discussing ways to streamline these measures with the state and federal agencies and have received constructive feedback.

7. Do you consent to have your name included along with your responses to this questionnaire in the FYR report?

   Yes

Calhoun Park Area Site **Five-Year Review Interview Form**

Site Name: Calhoun Park Area **EPA ID No.:** SCD987581337

Interviewer Name: _____ **Affiliation:** _____

Subject Name: Joel Padgett **Affiliation:** SCDHEC

Subject Contact Information: padgetjp@dhec.sc.gov

Time: _____ **Date:** 2/21/19

Interview Location: _____

Interview Format (circle one): In Person Phone Mail Other: (Email)

Interview Category: State Agency

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The NAPL/DNAPL Recovery System is slowly reducing the observed thicknesses and extent of NAPL/DNAPL in the Site source area (SCE&G Charlotte Street Substation). The groundwater contaminant plume appears to be stable to declining. The contractor maintains the recovery system and monitoring well network in good condition. Much of the Site has been redeveloped under Voluntary Cleanup Contracts (VCC) with SCDHEC.

2. What is your assessment of the current performance of the remedy in place at the Site?

   Pumping, chemical oxidant injection, and phytoremediation are effective in removing NAPL/DNAPL and reducing groundwater contaminants. Between October 1998 and May 2018, approximately 38,347 gallons of NAPL/DNAPL have been recovered. Historical concentrations of the principal groundwater contaminants, benzene and naphthalene, have fluctuated but show an overall declining trend.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   On July 3, 2017, SCDHEC received a request from a contractor for assessment information regarding a vacant parcel of land immediately south of the Site source area. The owner of the parcel, City of Charleston, was interested in marketing the parcel for sale. DHEC provided a copy of the most recent groundwater monitoring results to the contractor.

   On November 13, 2017, SCDHEC received a request from the State Newspaper for information on coal tar contamination sites in South Carolina including the Calhoun Park Site. SCDHEC provided relevant site files for review on November 15, 2017.

   In a February 9, 2018 telephone interview with SCDHEC, a Post and Courier newspaper reporter inquired about the status of the Site remediation and asked if contamination would affect the proposed International African American Museum to be constructed at the intersection of Inspection Street and Wharfside Street near the Site. SCDHEC provided an update on the status of the remediation and assured the reporter that there was no known Site-related contamination at the proposed Museum location.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   SCDHEC has provided review and comments to EPA and the site contractor regarding progress reports, groundwater monitoring results, and DNAPL removal reports. SCDHEC has also participated in conference calls and site visits to monitor the status of site remediation. On December18, 2018, SCDHEC, EPA, and the contractors conducted a site inspection for the 2019 5YR.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

   I am not aware of any changes to state laws that might affect the protectiveness of the Site's remedy.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   I am comfortable with the status of the institutional controls ICs at the Site. A Declaration of Covenants and Restrictions (DCR) for the Site source area was recorded with Charleston County on November 13, 2018. DCRs are in place for the Ansonborough/Concord Park Area of the Site that has been redeveloped under VCC with SCDHEC.

7. Are you aware of any changes in projected land use(s) at the Site?

   I am not aware of any changes in the projected land use(s) at the Site.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   In January 9, 2019 correspondence to EPA regarding review of the OU 1 Shallow Groundwater Monitoring Results- June 2018, SCDHEC suggested that the contractor distinguish between groundwater contaminants that were below laboratory reporting levels and those that were below laboratory minimum detection levels or non-detect. This distinction would help better define the downgradient edge of the groundwater contaminant plume.

9. Do you consent to have your name included along with your responses to this questionnaire in the FYR report?

   I consent to have my name included along with your responses to this questionnaire in the FYR report.

APPENDIX G – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Calhoun Park Area	**Date of Inspection: 12/18/18**
Location and Region: Charleston, SC 4	**EPA ID: SCD987581337**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: 60s and sunny**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other: DNAPL extraction, sediment capping, contaminated soil removal, phytoremediation and in-situ groundwater treatment

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** — Tom Effinger (Name) — SCE&G/Dominion Energy, Inc. (Title) — 2/25/19 (Date)
   Interviewed ☐ at site ☐ at office ☒ via email Phone: ____
   Problems, suggestions ☐ Report attached: Interview responses are included in Appendix F and summarized in section IV of this FYR.
2. **O&M Staff** — Rusty Contrael (Name) — Ace, Inc. (Title) — 2/19/19 (Date)
   Interviewed ☐ at site ☐ at office ☒ via email Phone: ____
   Problems/suggestions ☐ Report attached: Interview responses are included in Appendix F and summarized in section IV of this FYR.
4. **Other Interviews** (optional) ☐ Report attached: ____

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks: ____

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A
   ☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A
   Remarks: ____
3. **O&M and OSHA Training Records** ☒ Readily available ☒ Up to date ☐ N/A
   Remarks: ____
4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☒ Other permits: see below	☒ Readily available	☒ Up to date	☐ N/A

Remarks: While not required by the remedy, after on-site filtration, the PRP discharges any wastewater generated on site to the publicly-owned treatment works under a temporary discharge permit.

5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

10.	**Daily Access/Security Logs**	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house	☐ Contractor for state
☐ PRP in-house	☒ Contractor for PRP
☐ Federal facility in-house	☐ Contractor for Federal facility
☐ _____	

2. **O&M Cost Records**

☐ Readily available	☐ Up to date
☐ Funding mechanism/agreement in place	☒ Unavailable

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: Not applicable.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1.	**Fencing Damaged**	☐ Location shown on site map	☒ Gates secured	☐ N/A

Remarks: _____

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☒ N/A

Remarks: _____

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): _____

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☒ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

Institutional controls are in place; however, this FYR recommends officially documenting the need for institutional controls for the substation property soil, for site-related groundwater contamination outside of the substation property and for the sediment caps. See the Institutional Control Review section of this FYR for additional details.

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: Institutional controls are in place and adequate for the Site. See the Institutional Control Review section of this FYR for additional details.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☒ N/A

Remarks: _____

3. **Land Use Changes Off Site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads Damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

D. Cover Penetrations ☐ Applicable ☒ N/A

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

F. Cover Drainage Layer ☐ Applicable ☒ N/A

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

H. Retaining Walls ☐ Applicable ☒ N/A

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☒ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☒ Good condition ☐ Needs maintenance

Remarks: Extraction is of DNAPL rather than groundwater.

3. **Spare Parts and Equipment**

☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of groundwater treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: While not required by the remedy, any wastewater generated on site is collected in a 20,000-gallon frac tank and then filtered through a treatment train that includes sand and carbon filtration. Trees are also used for phytoremediation.

2. **Electrical Enclosures and Panels** (properly rated and functional)

☒ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☒ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☒ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: The remedy includes in-situ groundwater treatment (via injections, which have been completed) and ongoing long-term groundwater monitoring.

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs maintenance ☒ N/A Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

The remedy appears to be functioning as intended. Past soil removal actions addressed soil contamination, contaminated sediments were capped, and products were injected to groundwater to enhance contamination degradation. DNAPL removal is ongoing and the PRP is actively looking for ways to improve remedy performance.. Groundwater monitoring continues. Institutional controls are in place to prevent exposure to remaining site-related contamination. This FYR recommends official documentation of the need for institutional controls for the substation property soil, for site-related groundwater contamination outside of the substation property and for the sediment caps.. Phytoremediation is in place via tree plantings to improve groundwater quality.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M appears adequate; wells and pumping equipment were all in good condition during the inspection.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

The OU2 ROD estimated that intermediate groundwater monitoring would be needed for 12 years based on the expected effects of in situ treatment. Injections occurred in 2005 and 2006 (13 to 14 years ago), and COC concentrations at some intermediate wells are still not trending downward.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

The EPA and SCE&G are discussing reducing reporting requirements (such as monthly reports) to semiannually or annually.

APPENDIX H – SITE INSPECTION PHOTOS

Main entrance to the on-site SCE&G substation on Charlotte Street

Signage posted on a secondary site entrance on Charlotte Street

Office trailer on the SCE&G substation property

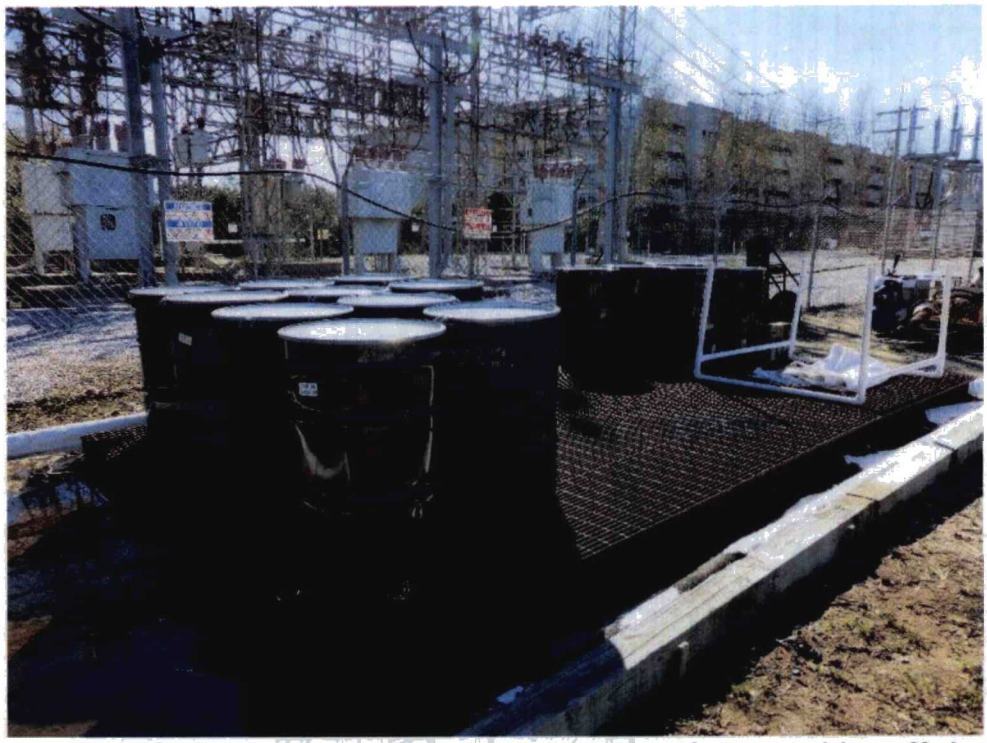
Former location of soil excavation within the substation fence, looking northwest toward Charlotte Street. The entire substation property is secured by tall wooden and chain-link fences with locking gates.

Line of hybrid poplar trees used in phytoremediation between the substation and parking garage

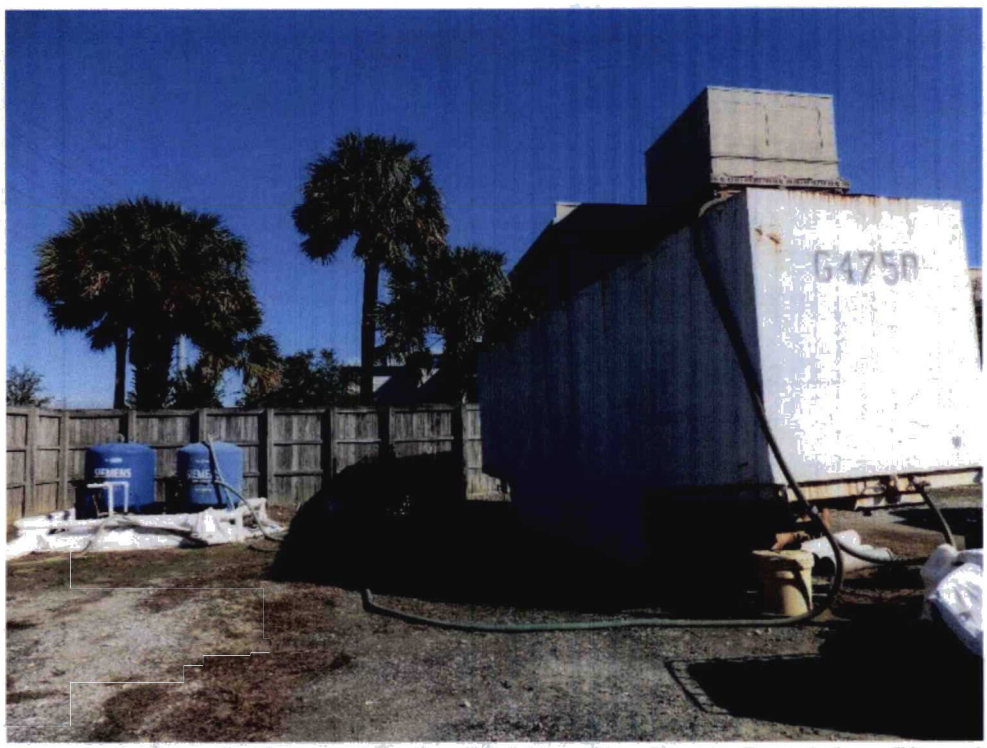
Active pumping of DNAPL from on-site recovery well DRW-35

DNAPL is automatically recovered at well DRW-06. The well is located within the footprint of the former gas holder.

Active DNAPL recovery at DRW-06

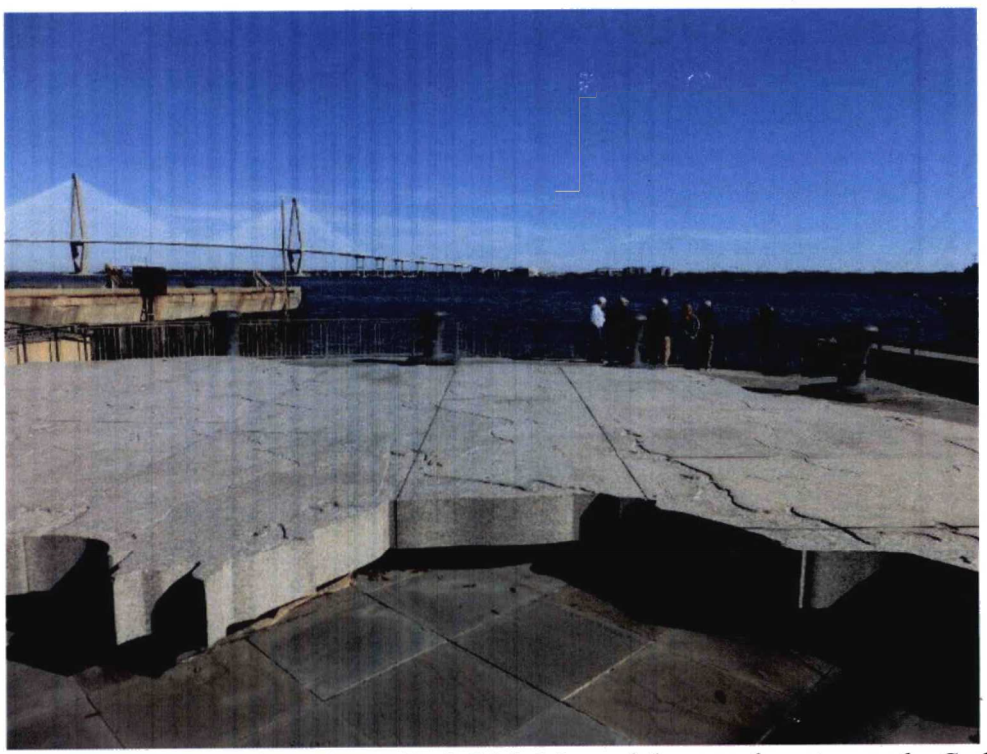


Full drums of recovered DNAPL staged within the substation fence, awaiting off-site transport



All wastewater generated on site is stored in this 20,000-gallon frac tank and then filtered through sand and carbon (filters shown in blue on the left), prior to discharge to the POTW

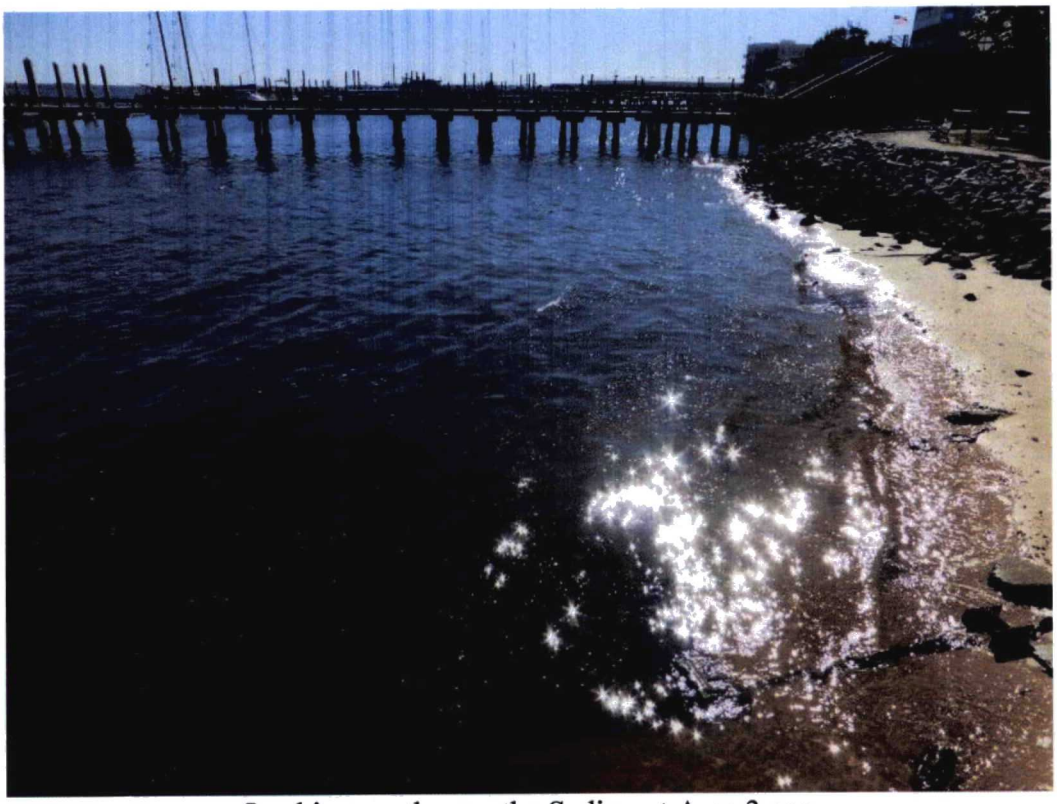
The original, steam power plant building, previously used as an IMAX theater



This platform, known as the Charlotte Street Park Irish Memorial, extends out over the Sediment Area 1 cap

Oyster Research Area between the South Carolina Aquarium and NPS tour boat facility

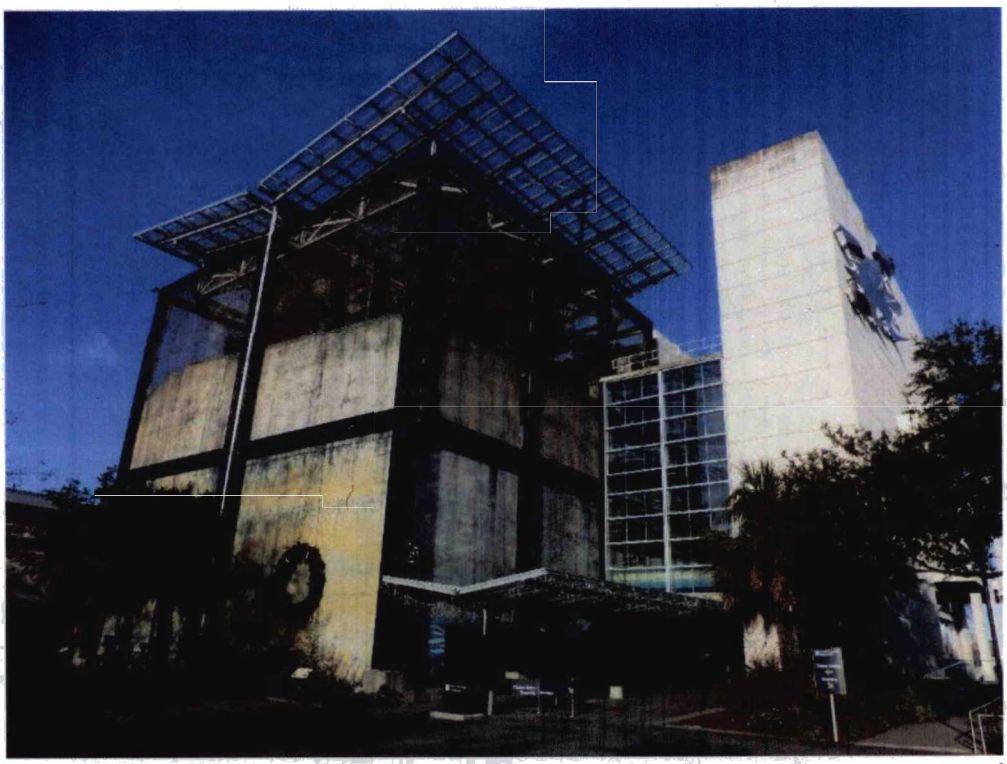
The Sediment Area 2 cap is located between the Oyster Research Area in the foreground and the dock in the background

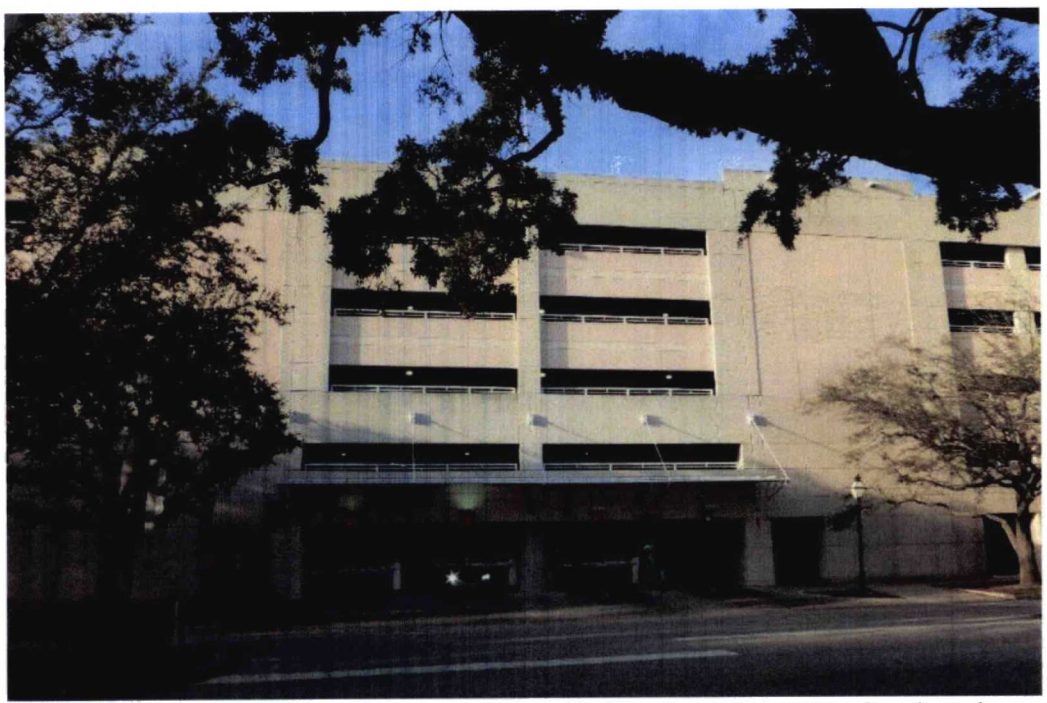


Looking south over the Sediment Area 3 cap

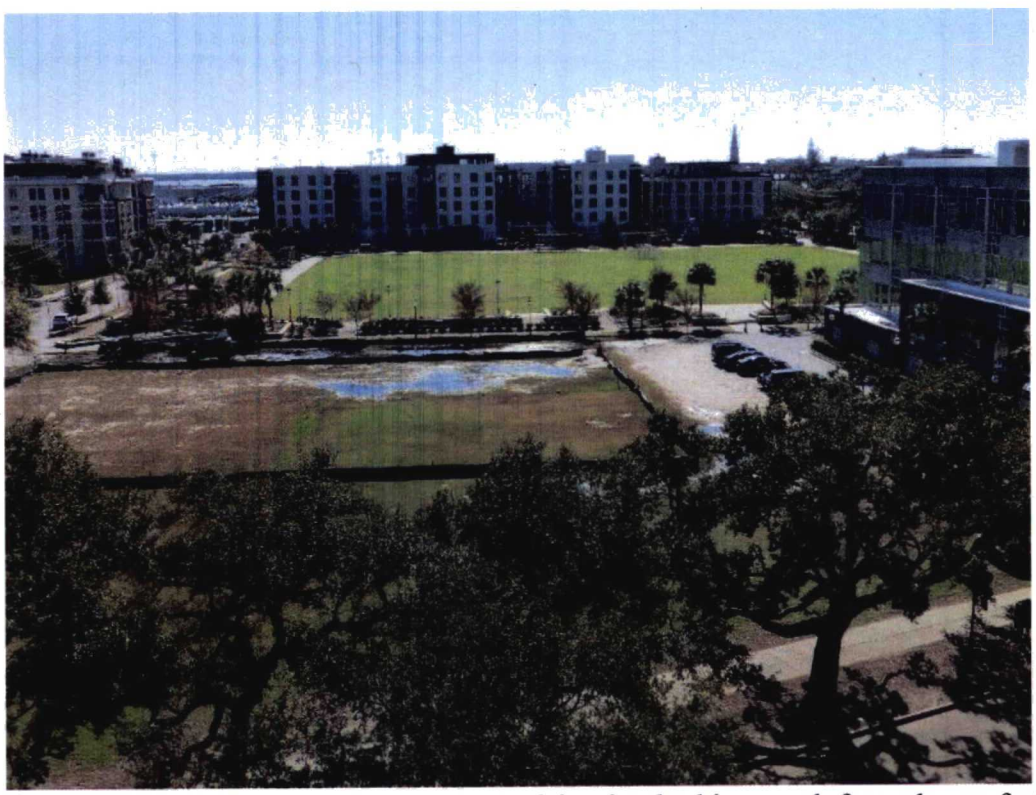
The concrete block mat that covers Sediment Area 3

Flush-mounted groundwater monitoring well LM-03A, located at the end of Aquarium Wharf


The South Carolina Aquarium is one of the several businesses that operate on site

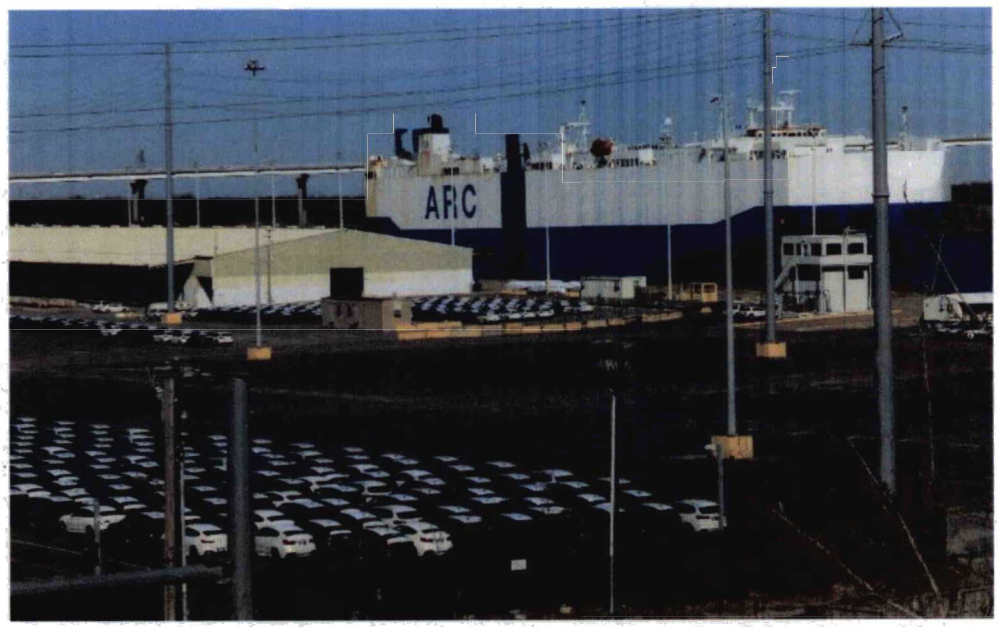


The City operates this parking garage on site, south of the SCE&G substation



View of the former Ansonborough property part of the site, looking south from the roof of the city parking garage. Gadsdenboro Park (formerly Concord Park) is the bright green area in the backround of the photo.

On-site commercial building at 25 Calhoun Street



View of the South Carolina Ports Authority property, north of the city parking garage

APPENDIX I – DETAILED DATA REVIEW

DNAPL Recovery

Manual DNAPL extraction continues to remove DNAPL from the subsurface. A total of 38,347 gallons of DNAPL have been removed from October 1998 to May 2018. Removal occurs via DNAPL recovery wells located in the collection trenches, automated recovery from DRW-06 located in the former gas holder, and recovery from groundwater monitoring wells and other DRW wells where DNAPL typically accumulates.

The DNAPL trench, recovery wells, recovery segments, and recovery volumes by segment are included in Figure 4. Over the last five years, the highest volumes of DNAPL recovered were from segment 7 (Table I-1). Segment 7 includes DRW-06, which is in the former gas holder, a main DNAPL source area that cannot be excavated. Starting in 2014, the recovered DNAPL volume has increased an order of magnitude in segment 7 (Figure 4). During the previous FYR period, the maximum volume extracted from Section 7 was 379 gallons. The highest-producing segments beside segment 7 include segments 2 and 6, which are near the source areas of the former rail spur and the former oil tanks; these segments indicate decreasing trends when compared to historical volumes. The DNAPL volume recovered from segment 1 has remained relatively stable since recovery began. Except for segments 1 and 7, the DNAPL volumes recovered indicate a downward trend when comparing this FYR period's volumes to historical data (Table I-1 and Figure 4).

Table I-1: DNAPL Recovery Volume by Segment

Recovery Period	DNAPL Recovery Volume by Segment (gallons)						
	1	2	3	4	5	6	7
Start of DNAPL recovery (December 2002 – November 2003)[a]	15.6	1,354.5	216.9	473.9	500.6	435.5	1,287.0
December 2012-November 2013	27.6	217.9	50.8	31.6	97.9	203.0	379.4
December 2013-November 2014	29.8	184.1	54.0	35.7	79.8	183.5	1,634.0
December 2014-November 2015	21.9	142.5	51.2	36.7	77.0	189.0	1,957.7
December 2015-November 2016	24.8	146.4	56.8	39.0	79.1	191.5	1,789.1
December 2016-November 2017	25.3	121.9	60.8	34.3	84.6	181.3	1,913.0
December 2017-May 2018[b]	7.8	49.6	25.1	14.5	33.9	81.9	844.8

Notes:
Source: Figure 1 of the 33rd DNAPL Report.
a. The first full year period was selected from Figure 1 of the 33rd DNAPL Report.
b. This is a 6-month recovery period rather than the typical 12-month period due to the timing of the report. This correspondingly impacts the recovery volumes.

Shallow Groundwater

Shallow groundwater is monitored to assess the restoration of the aquifer and evaluate the potential for contaminant migration. Currently, 13 monitoring wells (five sentinel and eight aqueous plume) are sampled during each monitoring event (Figure 5). Since December 2007, sampling has been performed every nine months to account for seasonal variation. The sampling events include groundwater level and DNAPL occurrence measurements. Groundwater samples are analyzed for benzene, toluene, ethylbenzene and xylene (BTEX), SVOCs comprised of PAHs, carbazole and 2,4-dimethylphenol, and cyanide. Shallow groundwater flow is shown on Figure I-1. In the June 2018 Shallow Groundwater Monitoring Report, benzene and naphthalene are used as indicator parameters to assess trends over time to evaluate remedial effectiveness and/or natural attenuation because both are common manufactured gas plant constituents. The historical benzene and naphthalene analytical results are provided in Figures I-2 to I-5. Shallow groundwater monitoring data from this FYR period are included in Figures I-9 and I-10. General trends from this FYR period are summarized below by well type.

Sentinel Wells

The sentinel wells at the Site monitor the potential for contamination migration. These wells are located on the eastern part of the Site next to the Cooper River (LM-10AR, LM-03A and MW-07AR), southeast of the former wood treater (MW-33) and northwest of the former gas holder (DW-04). There have been very few exceedances of cleanup goals in this FYR period in the sentinel wells. The only exceedances of cleanup goals in this FYR period occurred in well LM-10AR; these are included below in Table I-2. Based on historical data, these exceedances appear to be a more recent phenomenon, with exceedances and non-detections occurring without a clear trend in the past 8 years. The September 2017 exceedances were historic highs for these contaminants in LM-10AR. This may be due to the reoccurring or continued presence of DNAPL in this well. In addition, the detection limit for benzo(a)pyrene of 10 µg/L is above the cleanup goal of 0.2 µg/L and warrants evaluating whether it can be lowered.

Table I-2: COC Exceedances in Sentinel Well LM-10AR in FYR Period

Sampling Date	Concentration in Well LM-10AR (µg/L)	
	Benzo(a)pyrene[a]	Chrysene[b]
September 2014	10 U	10 U
June 2015	10 U	10 U
March 2016	**24**	**19**
December 2016	**27**	**24**
September 2017	**41 J**	**30 J**
June 2018	10 U	10 U

Notes:

Sources: The September 2014, June 2015, March 2016, December 2016, September 2017 and June 2018 Shallow Groundwater Monitoring Reports.

a. Benzo(a)pyrene ROD cleanup goal = 0.2 µg/L
b. Chrysene ROD cleanup goal = 20 µg/L. The June 2018 Shallow Groundwater Monitoring Report notes that the chrysene cleanup goal was changed to 200 µg/L and that this was approved in a SCDHEC letter dated May 23, 2002.

U = Indicates that the constituent was not detected at the reporting limit.
J = estimated value.
Bold = exceedance of cleanup goal

During this FYR period there have also been low level SVOC detections in LM-10AR. Naphthalene was detected once in this FYR period in LM-10AR (during December 2016 at a concentration of 33 micrograms per liter (µg/L), far below its cleanup goal of 1,500 µg/L). Other SVOCs were detected but do not have ROD-established cleanup goals. These relatively low levels of PAHs are attributed to the reoccurring or continued presence of DNAPL in LM-10AR. Cyanide was detected in LM-03A at a low concentration in 2018 (0.02 mg/L) that is well below the cleanup goal of 0.2 mg/L; it was not detected at any other point in this FYR period.

Besides the detections and exceedances summarized above, no other detections have occurred in this FYR period in sentinel wells. With the exception of LM-10AR, the sentinel well results indicate that groundwater contamination is not migrating off site. COC concentrations and DNAPL at well LM-10AR will continue to be closely monitored. If COC concentrations continue to increase, or if DNAPL thickness increases at well LM-10AR, further evaluation of that area may be warranted..

Aqueous Plume Wells

The aqueous plume wells monitor contamination trends in the shallow aquifer. These wells are located near the former gas holder on the substation property (MZ-02AR, MM-02A and MM-03A), near the former steam power plant/Luden's Marine (LM-02A and LM-01AR) and near the former oil/water separator discharge (MRW-01, MRW-02 and MW-14). Since 2014, benzene was not detected in three of the eight aqueous plume wells (LM-02A, MRW-02 and MW-14). Benzene cleanup goal exceedances in the other aqueous plume wells are summarized below in Table I-3. The highest benzene exceedance in the previous five years was in well MM-03A with a concentration of 3,440 µg/L. As seen below in Table I-3, concentrations fluctuated by up to two orders of magnitude during this FYR period, which is consistent with historical data (See Figure I-3).

Table I-3: Aqueous Plume Wells with Benzene Exceedances in FYR Period

Sampling Event	Benzene Concentration (µg/L)				
	Near the former gas holder			Near the former steam power plant/Luden's Marine and the former oil/water separator discharge	
	MZ-02AR	MM-02A	MM-03A	MRW-01	LM-01AR
September 2014	**100**	**6**	**62**	**830 (duplicate)**	5 U
June 2015	**6**	**11**	**151**	**574**	**151**
March 2016	**25**	5 U	5 U	**291**	**51**
December 2016	5 U	5 U	**3,440**	**263**	**157 (duplicate)**
September 2017	**6.5**	5 U	**334**	**611**	**88 J**
June 2018	**194**	**6.3**	**61**	**258**	**80.8**

Notes:
Sources: September 2014, June 2015, March 2016, December 2016, September 2017 and June 2018 Shallow Groundwater Monitoring Reports.
Benzene cleanup goal = 5 µg/L
When there was a duplicate sample, the higher concentration between the duplicate and the original samples was used.
U = Indicates that the constituent was not detected at the reporting limit.
J = estimated value.
Bold = exceedance of cleanup goal

Since 2014, naphthalene was not detected in samples from five of the eight aqueous plume wells (LM-02A, MM-02A, MRW-02, MW-14 and MZ-02AR). Naphthalene was detected but did not exceed the

cleanup goal in wells LM-01A and MRW-01. The only naphthalene exceedance in the last five years was observed in well MM-03A with a concentration of 3,190 µg/L, above its cleanup goal of 1,500 µg/L (Table I-4). As seen below in Table I-4 and in Figure I-5, naphthalene concentrations fluctuated during this FYR period at MM-03A.

Table I-4: Naphthalene in Aqueous Plume Well MM-03A in FYR Period

Sampling Event	Naphthalene Concentration in MM-03A (µg/L)
September 2014	10 U
June 2015	24
March 2016	10 U
December 2016	**3,190 J**
September 2017	153
June 2018	14

Notes:
Sources: September 2014, June 2015, March 2016, September 2017 and June 2018 Shallow Groundwater Monitoring Reports.
Naphthalene cleanup goal = 1,500 µg/L
When there was a duplicate sample, the higher concentration between the duplicate and the original samples was used.
U = Indicates that the constituent was not detected at the reporting limit.
J = estimated value.
Bold = exceedance of cleanup goal

Over the past five years the highest cumulative BTEX concentrations have generally been detected in wells MRW-01, MM-03A and LM-01AR. The highest cumulative SVOC concentrations were observed in wells MRW-01, MM-03A, LM-01AR and MM-14. SVOCs were not detected in several wells (LM-02A, MM-02A, MRW-02 and MZ-02AR) during this FYR period.

Cyanide has been detected above the 0.2 mg/L cleanup goal in every monitoring event in this FYR period except for March 2016. These exceedances have generally occurred in wells LM-01AR and MM-03A, with one exceedance in MZ-02AR in December 2016.

In the June 2018 Shallow Groundwater Monitoring Report, SCE&G recommended several optimization modifications to the monitoring program; these are discussed in more detail in Question A of this FYR.

Intermediate Groundwater

The current intermediate groundwater monitoring program was developed to provide data to demonstrate the long-term effectiveness of the in-situ chemical oxidation treatment areas and plume stability via natural attenuation processes at other areas of the Site. The OU2 ROD estimated that based on in situ treatment benefits, the total duration of intermediate groundwater monitoring would be 12 years, which has now been exceeded (injections occurred in 2005 and 2006, which is 13 to 14 years ago). Groundwater samples were collected from 13 to 17 (depending on the event) intermediate monitoring wells during this FYR period (Figure 5). The intermediate sand unit is split into upper, middle and lower sections. Groundwater is sampled every 9 months and analyzed for BTEX and SVOCs. The SVOCs consist of 2,4-dimethylphenol and carbazole and two PAHs, specifically naphthalene and benzo(a)pyrene. Intermediate groundwater flow is shown on Figure I-14. See Figures I-6 through I-8 for historical benzene and naphthalene results in the upper, middle and lower intermediate sand units relative to the in-situ chemical oxidation treatment areas. Intermediate groundwater monitoring data from this FYR period are included in Figures I-11 to I-13.

Upper Intermediate Sand Unit

Chemical oxidant injections occurred in the upper intermediate sand unit near wells PAMW-02, BM-08B and BM-03D, which are north, northwest and west of the former gas holder. In the upper intermediate sand unit, exceedances of benzene, ethylbenzene and naphthalene occurred far above their respective cleanup goals in every sampling event this FYR period, generally in wells BM-03D, BM-04D, BM-08B and MM-13C. Carbazole was detected above its cleanup goal once during this FYR period (in June 2014). In well BM-08B, concentrations of benzene and naphthalene have decreased from the historical highs prior to injections. In well PAMW-02, benzene concentrations in this FYR period have fluctuated between non-detect and 906 µg/L in March 2018, the highest benzene concentration observed in this well since 2010.

In well BM-03D, concentrations of benzene have decreased since treatment and have continued to slightly decline in this FYR period. However, concentrations remain well above the benzene cleanup goal of 5 µg/L. Naphthalene concentrations in well BM-03D are near and in some instances above pre-injection concentrations and above the cleanup goal.

Naphthalene concentrations in monitoring wells BM-04D and MM-13C and benzene concentrations in BM-04D appear consistent with pre-injection concentrations and do not demonstrate a clear trend in this FYR period (Table I-5). Benzene concentrations in this FYR period in MM-13C are below the pre-injection concentrations but still exceed the cleanup goal and have fluctuated.

Table I-5: Benzene and Naphthalene Concentrations in Upper Intermediate Sand Unit Wells

Sampling Event	Benzene and Naphthalene Concentrations (µg/L) (represented below as B and N)									
	Wells near chemical oxidant injections						Monitoring wells			
	BM-08B[a]		PAMW-02		BM-03D		BM-04D		MM-13C	
	B	N	B	N	B	N	B	N	B	N
Pre-injection (October 2001)	**45,000**	**12,000**	**2,600**	10 U	**35,000**	**11,000**	**20,000**	**7,100**	**56,000**	**4,600**
May 2014	**2,600**	85	5 U	10 U	**30,000**	**10,000**	**15,000**	**5,700**	**34,000**	**3,900**
March 2015	**1,180**	714	**52**	10 U	**27,500**	**13,300**	**11,400**	**7,650**	**1,540**	**3,460**
December 2015	NS		**63**	10 U	**26,300**	**10,800**	**21,400**	**9,020**	**33,000**	**3,500**
September 2016			5 U	10 U	**26,200 J**	**9,640 J**	**20,200**	**8,310**	**25,000**	**3,610**
June 2017			5 U	10 U	**23,300**	**11,800**	**18,700**	**9,730**	**18,300**	**4,560**
March 2018			**906**	10 U	**21,400**	**10,900**	**12,600**	**6,550**	**26,400**	**2,760**

Notes:
Source: Figure 3 of the July 2018 Intermediate Groundwater Monitoring Results Report.
a. BM-08B was abandoned on May 28, 2015.
Benzene cleanup goal = 5 µg/L
Naphthalene cleanup goal = 1,500 µg/L
U = Indicates that the constituent was not detected at the reporting limit.
J = estimated value.
NS = not sampled.
Bold = exceedance of cleanup goal

Middle Intermediate Sand Unit

Chemical oxidant injections occurred in the middle intermediate sand unit near wells LM-09B (on the Luden's property), PM-01C, BM-08B,[12] BM-10C (north/northwest/west of the substation) and CM-11D (on the former wood treating property).

In the middle intermediate sand unit, naphthalene was generally not detected in this FYR period in wells LM-08C, MM-12B, NM-06D, MM-14C, PM-01C, LM-09B, CM-11D and BM-07C. Benzene has generally not been detected in this FYR period in wells LM-08C, NM-06D, MM-14C, LM-09B, CM-11D and BM-07C. Historically and during this FYR period, LM-08C and NM-06D (the middle intermediate sand unit wells closest to the river) have had non-detect concentrations for benzene and naphthalene. This indicates contamination in this aquifer is not migrating.

Benzene exceedances have been consistent in wells MM-02D, PM-01C, MM-12B and BM-10C in this FYR period (Table I-6). MM-02D consistently had the highest benzene concentrations; this well is near the former gasholder and is in a natural attenuation area (i.e., this area did not receive bioremediation treatment), both of which may contribute to the higher concentrations found in this well.

[12] Well BM-08B is in the upper intermediate sand unit but is used in this context to indicate the location of the injection because there is no middle intermediate well there.

As seen in Table I-6, injections near CM-11D and LM-09B appeared effective and reduced concentrations to non-detect or very low detections; these wells were removed from the monitoring program due to this history. Naphthalene in well PM-01C has decreased since the injection and is now primarily not detected. Benzene during this FYR period in PM-01C shows a decreasing trend, but some concentrations exceed pre-injection concentrations; this injection does not appear to have successfully reduced benzene concentrations. Benzene and naphthalene concentrations in BM-10C trended downward following injections but have begun to increase since 2013; these increased concentrations are still below pre-treatment concentrations.

The only other contaminant exceedance in these wells in the FYR period was ethylbenzene in BM-10C in March and December 2015 at 768 µg/L and 719 µg/L, respectively. The ethylbenzene cleanup goal is 700 µg/L.

Table I-6: Benzene and Naphthalene Concentrations in Middle Intermediate Sand Unit Wells.

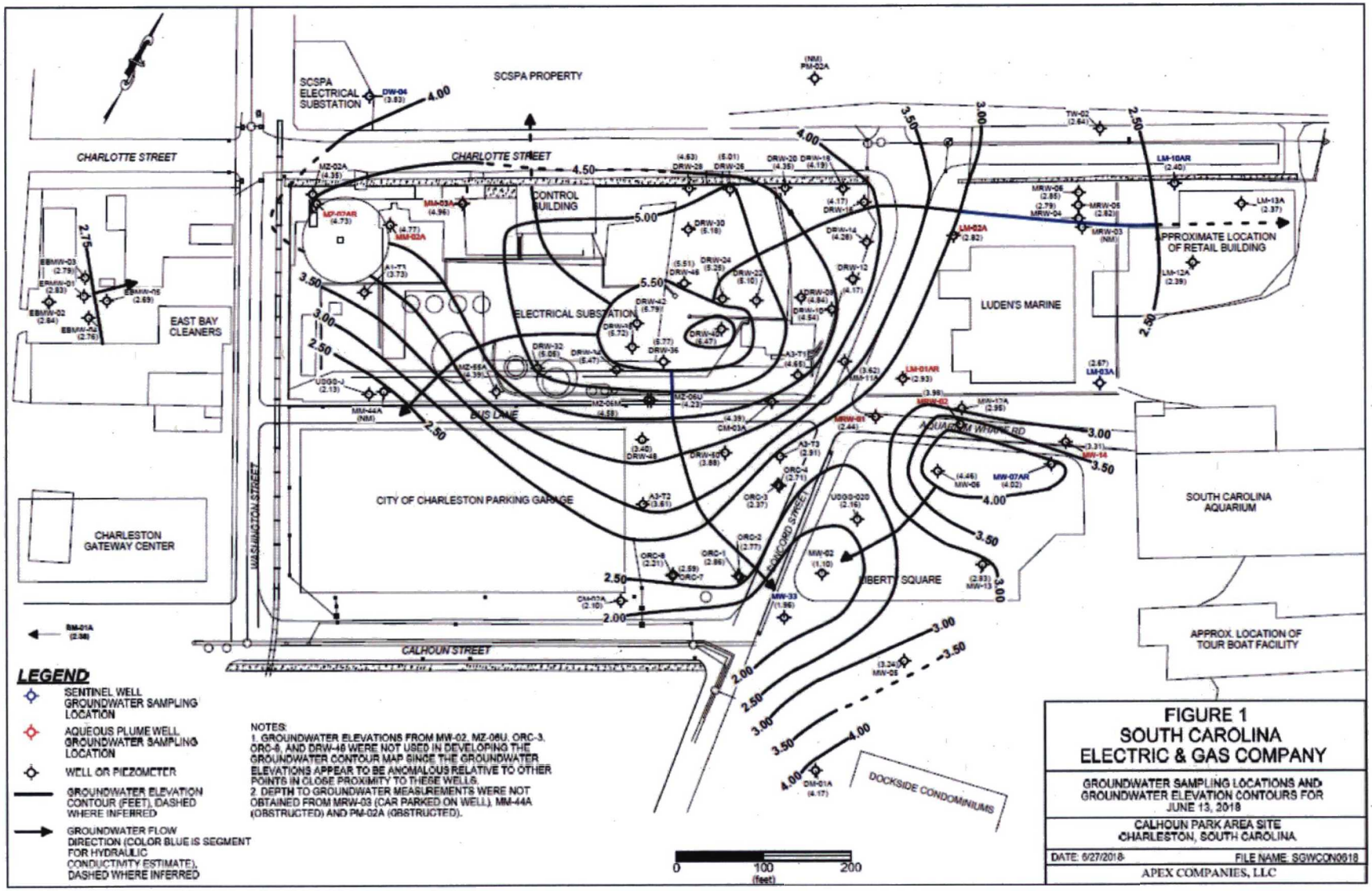
Sampling Event	Benzene and Naphthalene Concentrations (µg/L) (represented below as B and N)															
	Wells near chemical oxidant injections								Monitoring wells							
	LM-09B[a]		PM-01C		BM-10C		CM-11D[a]		MM-12B		MM-14C		MM-02D		BM-07C[a]	
	B	N	B	N	B	N	B	N	B	N	B	N	B	N	B	N
Pre-injection (October 2001)	**3,000**	**3,200**	**1,200**	160	**14,000**	**1,800**	**5,600**	69	**750**	150	**5,400**	**6,700**	**15,000**	**3,500**	**780**	13
May 2014	5 U	12	**1,900**	10 U	**7,700**	830	5 U	10 U	**500**	23	**8**	10 U	**27,000**	**3,900**	5 U	10 U
March 2015	5 U	10 U	**1,510**	10 U	**6,510**	996	5 U	10 U	**491**	11	5 U	10 U	**26,000**	**2,540**	5 U	10 U
December 2015	5 U	17	**1,210**	10 U	**9,890**	1,220	NS		**392**	10 U	5 U	10 U	**21,400**	**3,390**	NS	
September 2016	5 U	15	**947**	11	**7,370**	385			**339**	10 U	5 U	10 U	**23,400**	**4,570**		
June 2017	NS		**761**	10 U	**155**	10 U			**447**	10 U	**9**	10 U	**17,300**	**5,060**		
March 2018			**587**	10 U	**5,230**	411			**507**	10 U	5 U	10 U	**28,000**	**5,060**		

Notes:
Source: Figure 5 of the July 2018 Intermediate Groundwater Monitoring Results Report.
a. BM-07C and CM-11D were eliminated from the monitoring program in 2015. LM-09B was eliminated from the program in May 2017.
Benzene cleanup goal = 5 µg/L
Naphthalene cleanup goal = 1,500 µg/L
U = Indicates that the constituent was not detected at the reporting limit.
J = estimated value.
NS = not sampled.
Bold = exceedance of cleanup goal

Lower Intermediate Sand Unit

In the lower intermediate sand unit, benzene was the only contaminant to exceed its cleanup goal of 5 µg/L during this FYR period. It was detected in wells MM-01D and MM-16D at concentrations far below the other intermediate units, and concentrations indicate a downward trend in the last five years. In MM-16D, benzene was detected at 110 µg/L in May 2014 and 16 µg/L in March 2018. In MM-01D, benzene was detected at 150 µg/L in May 2014 and was not detected in March 2018. Naphthalene was not detected in either well in this FYR period.

Figure I-1: Shallow Groundwater Elevation Contours[13]



[13] Source: Figure 1 of the June 2018 Shallow Groundwater Monitoring Results.

Figure I-2: Historical Benzene Results in Shallow Groundwater Sentinel Wells[14]

TABLE 8

BENZENE HISTORICAL ANALYTICAL RESULTS - SENTINEL WELLS
JUNE 2018 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Sample Date	Units	DW-04	LM-03A	LM-10AR(1)	MW-07AR(1)	MW-33
January 1994	µg/L	--	10 U	--	10 U	--
Sept/Oct 1997	µg/L	--	--	--	--	5 U
February 1998	µg/L	--	--	--	--	--
April 1998	µg/L	--	--	--	--	--
May 1998	µg/L	--	--	--	--	--
July 1998	µg/L	--	--	--	--	--
October 1998	µg/L	--	--	--	--	--
Nov/Dec 1998	µg/L	5 U	--	--	5 U	5 U
March 1999	µg/L	--	--	68/67	--	--
June 1999	µg/L	--	--	--	--	--
Aug/Sept 1999	µg/L	--	--	--	--	--
July 2000	µg/L	5 U	5 U	--	5 U	5 U
December 2000	µg/L	5 U	5 U	27	5 U	5 U
March 2001	µg/L	5 U	5 U	6	5 U	5 U
June 2001	µg/L	5 U	5 U	5 U	5 U/5 U	5 U
September 2001	µg/L	5 U	5 U	8	5 U	5 U
December 2001	µg/L	5 U	5 U	5 U	5 U	5 U
March 2002	µg/L	5 U	5 U	5 U	5 U	5 U
March 2003	µg/L	5 U	5 U	5 U	5 U	5 U
March 2004	µg/L	5 U	5 U	5 U	5 U	5 U
March 2005	µg/L	5 U	5 U	5 U	5 U	5 U
March 2006	µg/L	5 U	5 U	5 U	5 U	5 U
March 2007	µg/L	5 U	5 U	5 U	5 U	5 U
December 2007	µg/L	5 U	5 U	5 U	5 U	5 U
September 2008	µg/L	5 U	5 U	5 U	5 U	5 U
June 2009	µg/L	5 U	5 U	5 U	5 U	5 U
March 2010	µg/L	5 U	5 U	5 U	5 U	5 U
December 2010	µg/L	5 U	5 U	5 U	42	5 U
September 2011	µg/L	5 U	5 U	5 U	14	5 U
June 2012	µg/L	5 U	5 U	5 U	5 U	5 U
March 2013	µg/L	5 U	5 U	5 U	5 U	5 U
December 2013	µg/L	5 U	5 U	5 U	5 U	5 U
September 2014	µg/L	5 U	5 U	5 U	5 U	5 U
June 2015	µg/L	5 U	5 U	5 U	5 U	5 U
March 2016	µg/L	5 U	5 U	5 U	5 U	5 U
December 2016	µg/L	5 U	5 U	5 U	5 U	5 U
September 2017	µg/L	5 UJ	5 U	5 UJ	5 U	5 UJ
June 2018	µg/L	5 U	5 U	5 U	5 U	5 U

Notes:
1. (1) - Replacement well.
2. U - Indicates that the constituent was not detected at the reporting limit.
3. UJ - Indicates that the constituent was not detected above the reporting limit but, due to cooler temperature exceeding 10 degrees Celsius, the result is also estimated "J".
4. Historical benzene analytical results from DRW-03 are no longer provided since the well was eliminated from groundwater monitoring after March 2010.

TABLES 1-11

Checked by: KJ
Date Checked: 8/16/2018

[14] Source: Table 8 of the June 2018 Shallow Groundwater Monitoring Results.

Figure I-3: Historical Benzene Results in Shallow Groundwater Aqueous Plume Wells[15]

TABLE 9

BENZENE HISTORICAL ANALYTICAL RESULTS - AQUEOUS PLUME WELLS
JUNE 2018 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Sample Date	Units	LM-01AR[1]	LM-02A	MM-02A	MM-03A	MRW-01[2]	MRW-02	MW-14	MZ-02AR
January 1994	µg/L	98	160	390	5,200	--	--	--	--
Sept/Oct 1997	µg/L	--	5 U	--	--	--	--	--	--
February 1998	µg/L	--	--	--	--	--	--	--	--
April 1998	µg/L	--	--	--	--	--	--	--	--
May 1998	µg/L	--	--	--	--	--	--	--	--
July 1998	µg/L	--	--	--	--	--	--	--	--
October 1998	µg/L	59	130 J	--	--	--	--	--	--
Nov/Dec 1998	µg/L	100	5 U	7	6,500	--	--	--	--
March 1999	µg/L	--	--	--	--	--	--	--	--
June 1999	µg/L	--	--	--	--	--	--	--	--
Aug/Sept 1999	µg/L	--	--	--	--	--	--	--	--
July 2000	µg/L	--	0.8 J	120	9,000	300	5 U[3]	--	--
December 2000	µg/L	190	22	8	4,200	220	5 U	--	4,200/3,700
March 2001	µg/L	150	5 U	24	1,900	220	5 U	--	--
June 2001	µg/L	--	5 U/5 U	13	7,900	--	5 U	--	4,000
September 2001	µg/L	54	34	10	3,700/3,800	--	5 U	--	3,000
December 2001	µg/L	7	5 U	5 U	1,900	--	5 U	--	2,000/1,800
March 2002	µg/L	7	5 U	8	1,160/1,170	--	5 U	--	3,770
June 2002	µg/L	7	5 U	10	8,310	1,050	7	--	3,840/3,770
September 2002	µg/L	17	5 U	11	1,200	1,300	5 U	--	1,000
December 2002	µg/L	99	5 U	20	1,900	310	5 U	--	200
March 2003	µg/L	170	5 U	18	160	460	5 U	--	680
June 2003	µg/L	48	5 U	10	270	700	5 U	--	150
September 2003	µg/L	35	5 U	25	1,100	1,500	8.2	--	33
December 2003	µg/L	5 U	14	8.4	6,900	260	5 U	--	440
March 2004	µg/L	180	5 U	15	680	440	5 U	--	320
June 2004	µg/L	5 U	5 U	--	--	860	5 U	--	--
September 2004	µg/L	5 U	5 U	11	180	1,000	5.5	--	18
December 2004	µg/L	5 U	5 U	--	--	360 J	5 U	--	--
March 2005	µg/L	21	5 U	14	1,100	460	5 U	--	220
June 2005	µg/L	5 U	14	--	--	850	5 U	--	--
September 2005	µg/L	5 U	5 U	7.3	7	1,100	7	--	31
December 2005	µg/L	5 U	5 U	--	--	290	5 U	--	--
March 2006	µg/L	5 U	39	11	220	460	5 U	--	71
June 2006	µg/L	5 U	5 U	--	--	510	5 U	--	--
September 2006	µg/L	5 U	5 U	12	380	750 J	5 U	--	78
December 2006	µg/L	5 U	5 U	--	--	360	5 U	14	--
March 2007	µg/L	5 U	5 U	24	640	220	5 U	23	400
June 2007	µg/L	--	--	--	--	--	--	21	--
September 2007	µg/L	--	--	--	--	--	--	13	--
December 2007	µg/L	12	5 U	12	3,600	75	5 U	5 U	90
September 2008	µg/L	98	5 U	10	320	300	5 U	13	23
June 2009	µg/L	5 U	5 U	9.8	5 U	600	5 U	5 U	450
March 2010	µg/L	120	9.8	38	160	370	5 U	12	280
December 2010	µg/L	5 U	5 U	15	7,300	300/300	5 U	5 U	84
September 2011	µg/L	200	5 U	19	4,100	590/610	5 U	5 U	220
June 2012	µg/L	8.8	5 U	17	150	420/430	5 U	5.1	14
March 2013	µg/L	5 U	5 U	14	650	130/110	5 U	5 U	160
December 2013	µg/L	31	5 U	14	4,200	340/340	5 U	5 U	65
September 2014	µg/L	5 U	5 U	6	62	820/830	5 U	5 U	100
June 2015	µg/L	151	5 U	11	151	574/549	5 U	5 U	6
March 2016	µg/L	51	5 U	5 U	5 U	291/268	5 U	5 U	25
December 2016	µg/L	134/157	5 U	5 U	3440	263	5 U	5 U	5 U
September 2017	µg/L	88 J / 55 J	5 UJ	5 U	334	611	5 U	5 U	6.5
June 2018	µg/L	80.8 / 79.9	5 U	6.3	81	258	5 U	5 U	194

Notes:

1. (1) - Replacement well.
2. (2) - Included with aqueous plume wells for presentation purposes.
3. (3) - Sample collected in August 2000.
4. U - Indicates that the constituent was not detected at the reporting limit.
5. J - Indicates an estimated value. The constituent was positively identified. However, the result was less than the quantitation limit but *greater than zero; or based on the data evaluation, the associated result is an approximate concentration of the constituent in the sample.* LM-01AR (September 2017) is estimated "J" since the cooler temperature exceeded 10 degrees Celsius.
6. UJ - LM-02A (September 2017): Indicates that the constituent was not detected above the reporting limit but, due to cooler temperature exceeding 10 degrees Celsius, the result is also estimated "J".

3LES 1-11

Checked by: KJ
Date Checked: 8/15/2018

[15] Source: Table 9 of the June 2018 Shallow Groundwater Monitoring Results.

Figure I-4: Historical Naphthalene Results in Shallow Groundwater Sentinel Wells[16]

TABLE 10

NAPHTHALENE HISTORICAL ANALYTICAL RESULTS - SENTINEL WELLS
JUNE 2018 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Sample Date	Units	DW-04	LM-03A	LM-10AR(1)	MW-07AR(1)	MW-33
January 1994	µg/L	--	0.7 J	--	65	--
Sept/Oct 1997	µg/L	--	--	--	--	10 U/10 U
February 1998	µg/L	--	--	--	--	10 U
April 1998	µg/L	--	--	--	--	--
May 1998	µg/L	--	--	--	--	10 U
July 1998	µg/L	--	--	--	--	10 U
October 1998	µg/L	--	--	--	--	10 U
Nov/Dec 1998	µg/L	5 U	--	--	9.6 U	25 U
March 1999	µg/L	--	--	2,100/2,300	--	10 U
June 1999	µg/L	--	--	--	--	5 U
Aug/Sept 1999	µg/L	--	--	--	--	5 U
July 2000	µg/L	10 U	10 U	--	3 J	10 U
December 2000	µg/L	10 U	10 U	1,100	10 U	--
March 2001	µg/L	10 U	10 U	10 UJ	10 UJ	10 U
June 2001	µg/L	10 U	10 U	20	10 U/10 U	10 U
September 2001	µg/L	10 U	10 U	12	10 U	10 U
December 2001	µg/L	--	10 U	10 U	10 U	10 U
March 2002	µg/L	10 U	10 U	10 U	10 U	10 U
March 2003	µg/L	10 U	10 U	10 UJ	10 U	10 U
March 2004	µg/L	10 U	10 U	10 U	10 U	10 U
March 2005	µg/L	10 U	10 U	10 U	10 U	10 U
March 2006	µg/L	10 U	10 U	10 U	10 U	10 U
March 2007	µg/L	10 U	10 U	10 U	10 U	10 U
December 2007	µg/L	10 U	10 U	10 U	10 U	10 U
September 2008	µg/L	10 U	10 U	10 U	10 U	10 U
June 2009	µg/L	10 U	10 U	10 U	10 U	10 U
March 2010	µg/L	10 U	10 U	10 U	10 U	10 U
December 2010	µg/L	10 U	10 U	10 U	10 U	10 U
September 2011	µg/L	10 U	10 U	10 UJ	10 U	10 U
June 2012	µg/L	10 U	10 U	25 U	10 U	10 U
March 2013	µg/L	10 U	10 U	10 U	10 U	10 U
December 2013	µg/L	10 U	10 U	40	12 U	10 U
September 2014	µg/L	10 U	11 U	10 U	10 U	10 U
June 2015	µg/L	10 U	10 U	10 U	10 U	10 U
March 2016	µg/L	10 U	10 U	10 U	10 U	10 U
December 2016	µg/L	10 U	10 U	33	10 U	10 U
September 2017	µg/L	10 UJ	10 U	10 U	10 U	10 UJ
June 2018	µg/L	10 U	10 U	10 U	10 U	10 U

Notes:

1. (1) - Replacement well.
2. U - Indicates that the constituent was not detected at the reporting limit.
3. J - Indicates an estimated value. The constituent was positively identified. However, the result was less than the quantitation limit but greater than zero; or based on the data evaluation, the associated result is an approximate concentration of the constituent in the sample.
4. UJ - Indicates that the constituent was not detected above the reporting limit. However, based on the data evaluation, the reported result is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the concentration of the constituent in the sample. DW-04 (September 2017) is qualified "UJ" since cooler temperature exceeded 10 degrees Celsius.

TABLES 1-11

Checked by: KJ
Date Checked: 8/16/2018

[16] Source: Table 10 of the June 2018 Shallow Groundwater Monitoring Results.

Figure I-5: Historical Naphthalene Results in Shallow Groundwater Aqueous Plume Wells[17]

TABLE 11

NAPHTHALENE HISTORICAL ANALYTICAL RESULTS - AQUEOUS PLUME WELLS
JUNE 2018 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Sample Date	Units	LM-01AR(1)	LM-02A	MM-02A	MM-03A	MRW-01(2)	MRW-02	MW-14	MZ-02AR(1)
January 1994	µg/L	700 J	1,300	17	5,500	--	--	--	--
Sept/Oct 1997	µg/L	--	29	--	--	--	--	--	--
February 1998	µg/L	--	--	--	--	--	--	--	--
April 1998	µg/L	--	--	--	--	--	--	--	--
May 1998	µg/L	--	--	--	--	--	--	--	--
July 1998	µg/L	--	--	--	--	--	--	--	--
October 1998	µg/L	52	30 J	--	--	--	--	--	--
Nov/Dec 1998	µg/L	150	10 U	10 U	5,000	--	--	--	--
March 1999	µg/L	--	--	--	--	--	--	--	--
June 1999	µg/L	--	--	--	--	--	--	--	--
Aug/Sept 1999	µg/L	--	--	--	--	--	--	--	--
July 2000	µg/L	--	3 J	78	3,900	530	5 U(3)	--	--
December 2000	µg/L	1,300	10 U	10 U	3,100	17	10 U	--	10 U/10 U
March 2001	µg/L	820	10 U	10 UJ	1,400 J	28	10 U	--	--
June 2001	µg/L	--	10 U/10 U	10 U	3,200	--	10 U	--	10 UR
September 2001	µg/L	310	26	10 U	2,000 J/4,000 J	--	10 U	--	810
December 2001	µg/L	110 J	10 UJ	10 U	3,000	--	10 U	--	170 J/10 UJ
March 2002	µg/L	66	10 U	10 U	840 J/660 J	--	10 U	--	710
June 2002	µg/L	37	10 U	10 U	2,000	940	10 U	--	810 J/1,200 J
September 2002	µg/L	11	10 U	10 U	400	1,900	10 U	--	59
December 2002	µg/L	78	10 UJ	10 U	2,200	160 J	10 UJ	--	10 U
March 2003	µg/L	2,500 J	10 U	10 U	10 U	83	10 U	--	10 U
June 2003	µg/L	10 U	10 U	10 U	53	770	10 U	--	10 U
September 2003	µg/L	10 U	10 U	10 U	1,400	3,600	10 U	--	10 U
December 2003	µg/L	10 U	23	10 U	2,800	10 U	10 U	--	10 U
March 2004	µg/L	290	10 U	10 U	99	910	10 U	--	10 U
June 2004	µg/L	10 U	10 U	--	--	2,500	10 U	--	--
September 2004	µg/L	10 U	10 U	10 U	10 U	1,800	12	--	10 U
December 2004	µg/L	10 U	10 U	--	--	10 U	11	--	--
March 2005	µg/L	32	10 U	10 U	370	1,500 J	12	--	10 U
June 2005	µg/L	10 U	10 U	--	--	1,000	10 U	--	--
September 2005	µg/L	10 U	10 U	10 U	10 U	6,400	18	--	10 U
December 2005	µg/L	10 U	10 U	--	--	34	10 U	--	--
March 2006	µg/L	10 U	64	NA(2)	10 U	440 J	10 U	--	10 U
June 2006	µg/L	10 U	10 U	--	--	770 J	10 U	--	--
September 2006	µg/L	10 U	10 U	10 U	10 U	2,700	10 U	--	10 U
December 2006	µg/L	10 U	10 U	--	--	280 J	10 U	45	--
March 2007	µg/L	10 U	10 U	10 U	190 J	10 U	10 U	39	10 U
June 2007	µg/L	--	--	--	--	--	--	36	--
September 2007	µg/L	--	--	--	--	--	--	18	--
December 2007	µg/L	44	10 U	10 U	1,700	21	10 U	10 U	10 U
September 2008	µg/L	200	10 U	10 U	17 J	1,200	10 U	10 U	10 U
June 2009	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	34
March 2010	µg/L	120	16	10 U	28	920	10 U	10 U	11
December 2010	µg/L	10 U	10 U	10 U	4,400	710/730	10 U	10 U	13
September 2011	µg/L	390	10 UJ	10 U	2,900	3,100/3,100	10 U	10 U	71
June 2012	µg/L	28	25 U	10 U	10 U	330/350	10 U	10 U	10 U
March 2013	µg/L	10 U	10 U	10 U	10 U	320/340	10 U	10 U	10 U
December 2013	µg/L	44	10 U	10 U	3,200	10 U/10 U	10 U	10 U	14 J
September 2014	µg/L	10 U	10 U	10 U	10 U	1,000/920	10 U	10 U	10 U
June 2015	µg/L	328	10 U	10 U	24	810/818	10 U	10 U	10 U
March 2016	µg/L	95	10 U	10 U	10 U	199/122	10 U	10 U	10 U
December 2016	µg/L	400/434	10 U	10 U	3190 J	220	10 U	10 U	10 U
September 2017	µg/L	355 J/282 J	11 UJ	10 U	153	768	10 U	10 U	10 U
June 2018	µg/L	405 / 354	10 U	10 U	14	218	10 U	10 U	10 U

Notes:

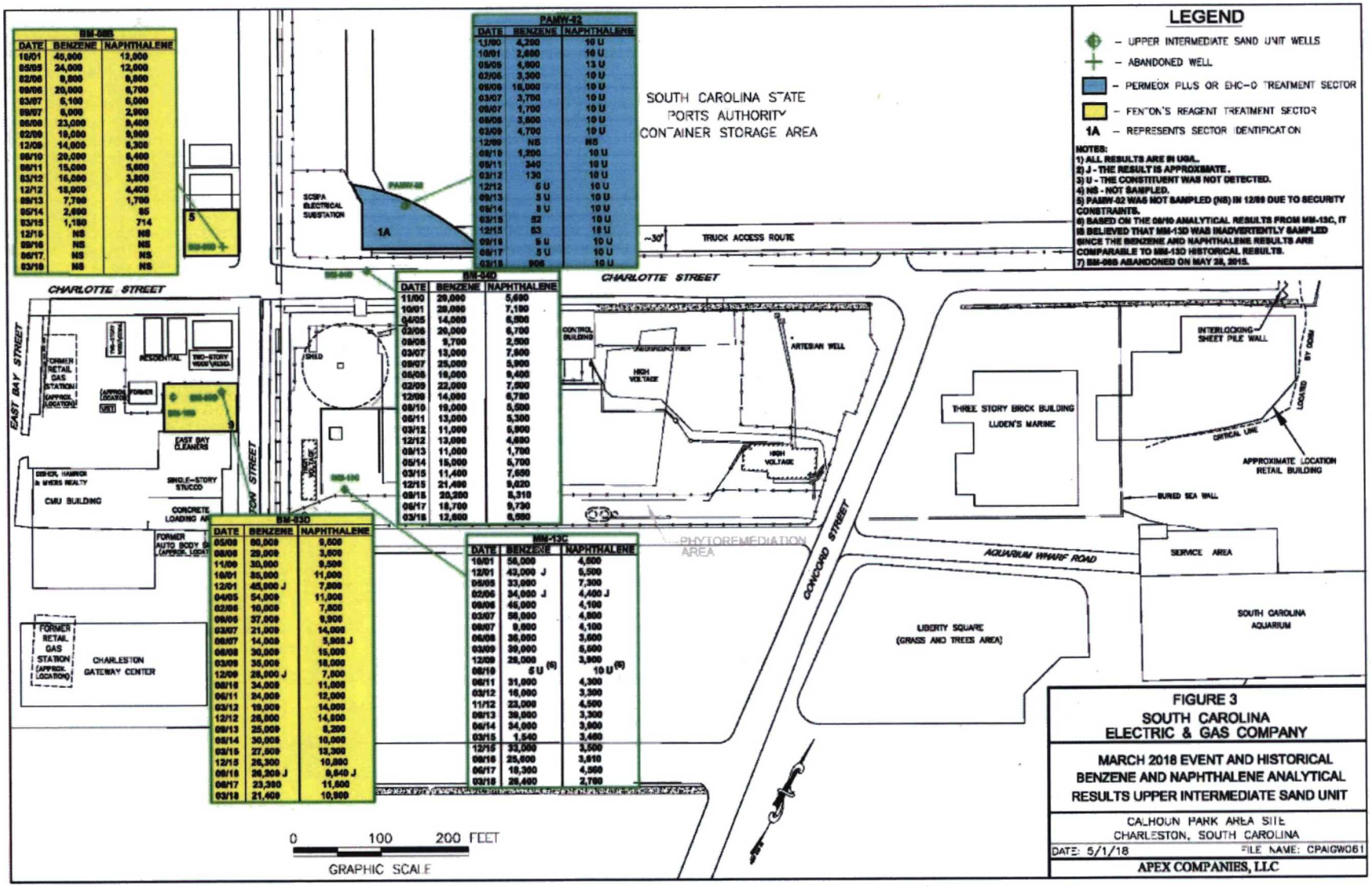
1. (1) - Replacement well.
2. (2) - Included with aqueous plume wells for presentation purposes.
3. (3) - Sample collected in August 2000.
4. U - Indicates that the constituent was not detected at the reporting limit.
5. J - Indicates an estimated value. The constituent was positively identified. However, the result was less than the quantitation limit but greater than zero; or based on the data evaluation, the associated result is an approximate concentration of the constituent in the sample. LM-01AR (September 2017) is qualified "J" since cooler temperature exceeded 10 degrees Celsius.
6. UJ - Indicates that the constituent was not detected above the reporting limit. However, based on the data evaluation, the reported result is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the concentration of the constituent in the sample. LM-02A (September 2017) is qualified "UJ" since cooler temperature exceeded 10 degrees Celsius.

JES 1-11

Checked by: KJ
Date Checked 8/15/2018

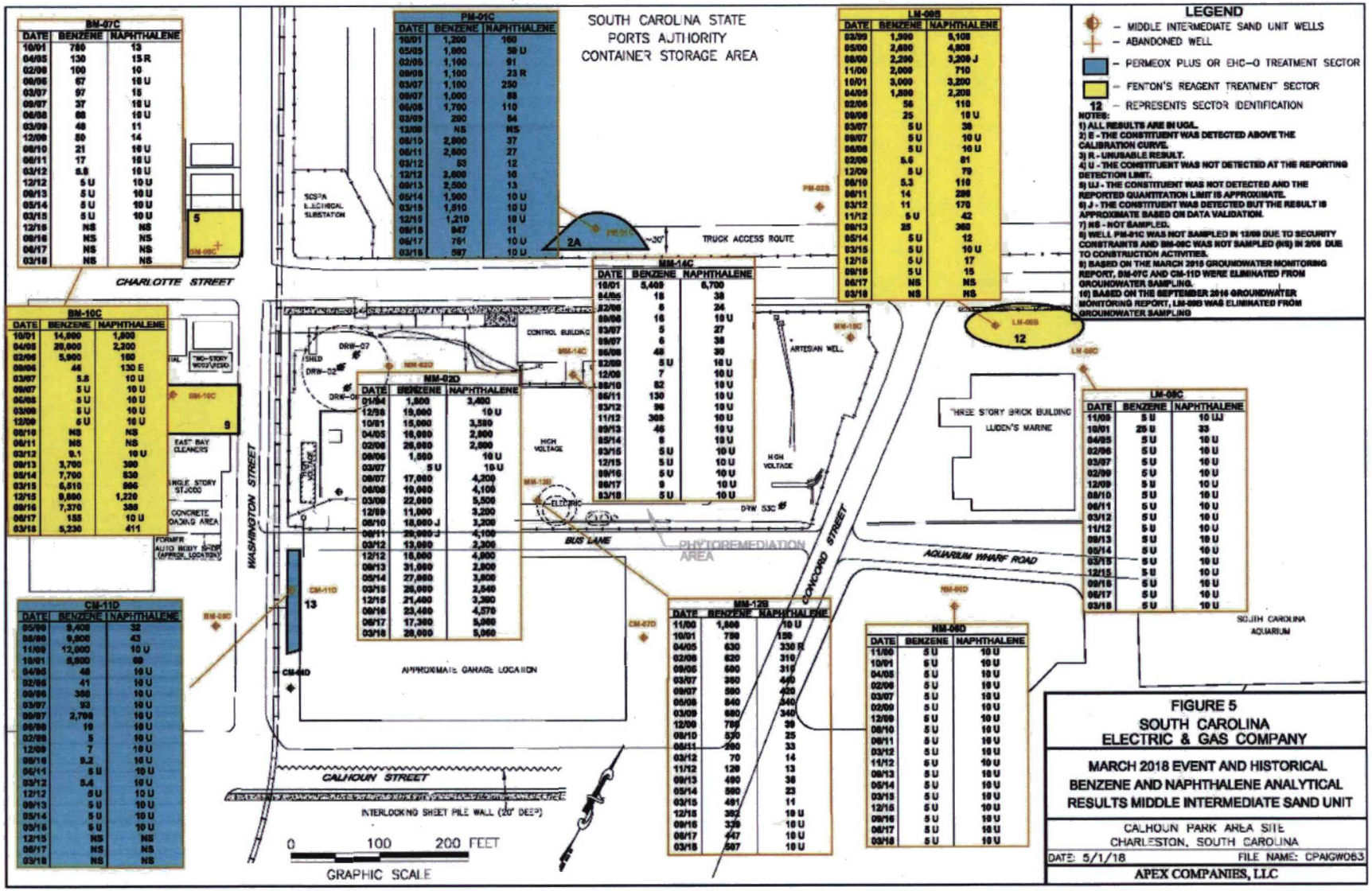
[17] Source: Table 11 of the June 2018 Shallow Groundwater Monitoring Results.

Figure I-6: March 2018 Event & Historical Benzene and Naphthalene Analytical Results in the Upper Intermediate Sand Unit[18]



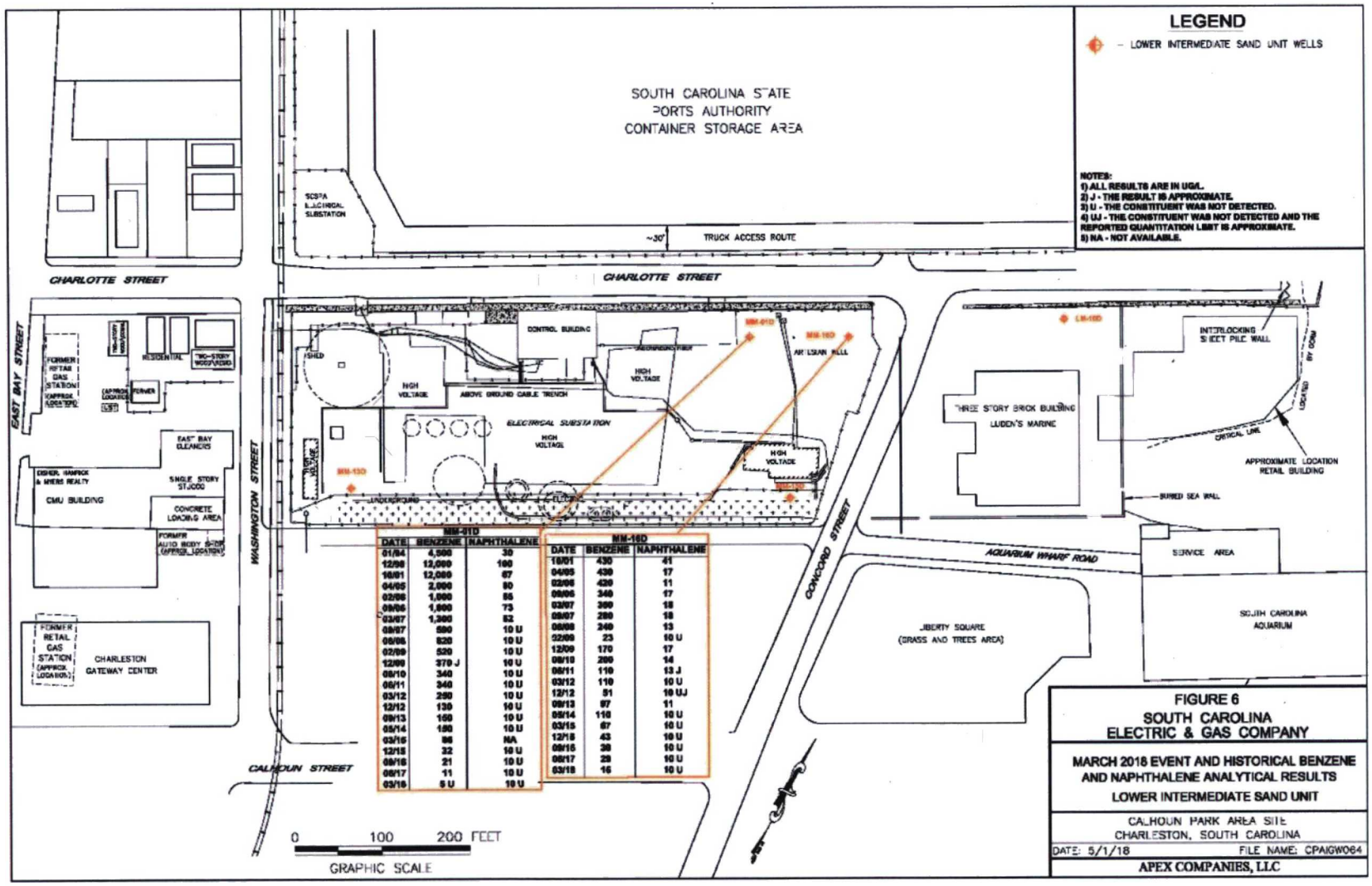
[18] Source: Figure 3 of the July 2018 Intermediate Groundwater Monitoring Results Report.

Figure I-7: March 2018 Event & Historical Benzene and Naphthalene Analytical Results in the Middle Intermediate Sand Unit[19]



[19] Source: Figure 5 of the July 2018 Intermediate Groundwater Monitoring Results Report.

Figure I-8: March 2018 Event & Historical Benzene and Naphthalene Analytical Results in the Lower Intermediate Sand Unit[20]



MW-01D		
DATE	BENZENE	NAPHTHALENE
01/04	4,500	30
12/98	12,000	100
10/01	12,000	87
04/05	2,000	90
03/06	1,000	85
09/06	1,900	75
03/07	1,300	82
09/07	590	10 U
09/08	520	10 U
02/09	520	10 U
12/09	370 J	10 U
09/10	340	10 U
06/11	340	10 U
03/12	290	10 U
12/12	130	10 U
09/13	160	10 U
05/14	150	10 U
03/15	86	NA
12/15	32	10 U
09/16	21	10 U
09/17	11	10 U
03/18	5 U	10 U

MW-10D		
DATE	BENZENE	NAPHTHALENE
10/01	430	41
04/05	430	17
03/06	420	11
09/06	340	17
03/07	360	18
09/07	280	18
09/08	240	13
02/09	23	10 U
12/09	170	17
09/10	200	14
06/11	110	13 J
03/12	110	10 U
12/12	51	10 UJ
09/13	97	11
05/14	110	10 U
03/15	87	10 U
12/15	43	10 U
09/16	30	10 U
09/17	29	10 U
03/18	16	10 U

[20] Source: Figure 6 of the July 2018 Intermediate Groundwater Monitoring Results Report.

Figure I-9: Shallow Groundwater Sentinel Well Results, 2014-2018[21]

SUMMARY OF SENTINEL WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
SEPTEMBER 2014 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	DW-04	LM-03A	LM-10AR	MW-07AR	MW-33
Volatiles						
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	5 U	5 U	5 U	5 U	5 U
Semi-Volatiles						
2,4-Dimethylphenol	µg/L	10 U	11 U	10 U	10 U	10 U
Acenaphthene	µg/L	10 U	11 U	10 U	10 U	10 U
Acenaphthylene	µg/L	10 U	11 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	11 U	10 U	10 U	10 U
Benzo(a)anthracene	µg/L	10 U	11 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	10 U	11 U	10 U	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 U	11 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 U	11 U	10 U	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 U	11 U	10 U	10 U	10 U
Carbazole	µg/L	10 U	11 U	10 U	10 U	10 U
Chrysene	µg/L	10 U	11 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 U	11 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	11 U	10 U	10 U	10 U
Fluorene	µg/L	10 U	11 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 U	11 U	10 U	10 U	10 U
Naphthalene	µg/L	10 U	11 U	10 U	10 U	10 U
Phenanthrene	µg/L	10 U	11 U	10 U	10 U	10 U
Pyrene	µg/L	10 U	11 U	15	10 U	10 U
Conventional						
Cyanide	mg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Note:
1. U - Indicates that the consitutent was not detected at the reported detection limit.

SUMMARY OF SENTINEL WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
JUNE 2015 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	DW-04	LM-03A	LM-10AR	MW-07AR	MW-33
Volatiles						
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Totuene	µg/L	5 U	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	5 U	5 U	5 U	5 U	5 U
Semi-Volatiles						
2,4-Dimethylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
Acenaphthene	µg/L	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	10 U	10 U	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	10 U	21	10 U	10 U
Fluorene	µg/L	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
Phenanthrene	µg/L	10 U	10 U	10 U	10 U	10 U
Pyrene	µg/L	10 U	10 U	23	10 U	10 U
Conventional						
Cyanide	mg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Note:
1. U - Indicates that the consitutent was not detected at the reported detection limit.

[21] These tables are taken from the September 2014, June 2015, March 2016, September 2017 and June 2018 Shallow Groundwater Monitoring Reports.

SUMMARY OF SENTINEL WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
MARCH 2016 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	DW-04	LM-03A	LM-10AR	MW-07AR	MW-33
Volatiles						
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	5 U	5 U	5 U	5 U	5 U
Semi-Volatiles						
2,4-Dimethylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
Acenaphthene	µg/L	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	11	10 U	10 U
Benzo(a)anthracene	µg/L	10 U	10 U	24	10 U	10 U
Benzo(a)pyrene	µg/L	10 U	10 U	24	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 U	10 U	27	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 U	10 U	12	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	10 U	10 U	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	19	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	10 U	57	10 U	10 U
Fluorene	µg/L	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 U	10 U	12	10 U	10 U
Naphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
Phenanthrene	µg/L	10 U	10 U	29	10 U	10 U
Pyrene	µg/L	10 U	10 U	51	10 U	10 U
Conventional						
Cyanide	mg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Note:

1. U - Indicates that the consitutent was not detected at the reported detection limit.

SUMMARY OF SENTINEL WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
DECEMBER 2016 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	DW-04	LM-03A	LM-10AR	MW-07AR	MW-33
Volatiles						
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	5 U	5 U	5 U	5 U	5 U
Semi-Volatiles						
2,4-Dimethylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
Acenaphthene	µg/L	10 U	10 U	21	10 U	10 U
Acenaphthylene	µg/L	10 U	10 U	11	10 U	10 U
Anthracene	µg/L	10 U	10 U	13	10 U	10 U
Benzo(a)anthracene	µg/L	10 U	10 U	26	10 U	10 U
Benzo(a)pyrene	µg/L	10 U	10 U	27	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 U	10 U	30	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 U	10 U	14	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 U	10 U	11	10 U	10 U
Carbazole	µg/L	10 U	10 U	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	24	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	10 U	72	10 U	10 U
Fluorene	µg/L	10 U	10 U	17	10 U	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 U	10 U	13	10 U	10 U
Naphthalene	µg/L	10 U	10 U	33	10 U	10 U
Phenanthrene	µg/L	10 U	10 U	40	10 U	10 U
Pyrene	µg/L	10 U	10 U	66	10 U	10 U
Conventional						
Cyanide	mg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Note:

1. U - Indicates that the consitutent was not detected at the reported detection limit.

SUMMARY OF SENTINEL WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
SEPTEMBER 2017 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	DW-04	LM-03A	LM-10AR	MW-07AR	MW-33
Volatiles						
Benzene	µg/L	5 UJ	5 U	5 UJ	5 U	5 UJ
Ethylbenzene	µg/L	5 UJ	5 U	5 UJ	5 U	5 UJ
Toluene	µg/L	5 UJ	5 U	5 UJ	5 U	5 UJ
Total Xylenes	µg/L	5 UJ	5 U	5 UJ	5 U	5 UJ
Semi-Volatiles						
2,4-Dimethylphenol	µg/L	10 UJ	10 U	10 UJ	10 U	10 UJ
Acenaphthene	µg/L	10 UJ	10 U	17 J	10 U	10 UJ
Acenaphthylene	µg/L	10 UJ	10 U	17 J	10 U	10 UJ
Anthracene	µg/L	10 UJ	10 U	15 J	10 U	10 UJ
Benzo(a)anthracene	µg/L	10 UJ	10 U	38 J	10 U	10 UJ
Benzo(a)pyrene	µg/L	10 UJ	10 U	41 J	10 U	10 UJ
Benzo(b)fluoranthene	µg/L	10 UJ	10 U	45 J	10 U	10 UJ
Benzo(g,h,i)perylene	µg/L	10 UJ	10 U	20 J	10 U	10 UJ
Benzo(k)fluoranthene	µg/L	10 UJ	10 U	14 J	10 U	10 UJ
Carbazole	µg/L	10 UJ	10 U	10 UJ	10 U	10 UJ
Chrysene	µg/L	10 UJ	10 U	30 J	10 U	10 UJ
Dibenz(a,h)anthracene	µg/L	10 UJ	10 U	10 UJ	10 U	10 UJ
Fluoranthene	µg/L	10 UJ	10 U	82 J	10 U	10 UJ
Fluorene	µg/L	10 UJ	10 U	12 J	10 U	10 UJ
Indeno(1,2,3-cd)pyrene	µg/L	10 UJ	10 U	20 J	10 U	10 UJ
Naphthalene	µg/L	10 UJ	10 U	10 UJ	10 U	10 UJ
Phenanthrene	µg/L	10 UJ	10 U	36 J	10 U	10 UJ
Pyrene	µg/L	10 UJ	10 U	79 J	10 U	10 UJ
Conventional						
Cyanide	mg/L	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ

Notes:
1. U - Indicates that the consitutent was not detected at the reported detection limit.
2. UJ - Indicates that the constituent was not detected above the reporting limit but, due to cooler temperature exceeding 10 degrees Celsius, the result is also estimated "J".
3. J - Indicates estimated value since cooler temperature exceeded 10 degrees Celsius.

SUMMARY OF SENTINEL WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
JUNE 2018 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	DW-04	LM-03A	LM-10AR	MW-07AR	MW-33
Volatiles						
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	5 U	5 U	5 U	5 U	5 U
Semi-Volatiles						
2,4-Dimethylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
Acenaphthene	µg/L	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	10 U	10 U	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	10 U	10	10 U	10 U
Fluorene	µg/L	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
Phenanthrene	µg/L	10 U	10 U	10 U	10 U	10 U
Pyrene	µg/L	10 U	10 U	11.9	10 U	10 U
Conventional						
Cyanide	mg/L	0.005 U	0.02	0.005 U	0.005 U	0.005 U

Notes:
1. U - Indicates that the consitutent was not detected at the reporting limit.

Figure I-10: Shallow Groundwater Aqueous Plume Well Results, 2014-2018[22]

SUMMARY OF AQUEOUS PLUME WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
SEPTEMBER 2014 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	LM-01AR	LM-02A	MM-02A	MM-03A	MRW-01	FD09242014 Duplicate of MRW-01	MRW-02	MW-14	MZ-02AR
Volatiles										
Benzene	µg/L	5 U	5 U	6	62	820	830	5 U	5 U	100
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	98	88	5 U	5 U	5.3
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	5 U	5 U	5 U	5 U	112	103	5 U	5 U	22
Semi-Volatiles										
2,4-Dimethylphenol	µg/L	10 U	10 U	10 U	10 U	110	10 UJ	10 U	10 U	10 U
Acenaphthene	µg/L	14	10 U	10 U	10 U	190	170	12	21	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	11 U	10 UJ	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U	17	17 J	10 U	10 U	10 U
Benzo(a)anthracene	µg/L	10 U	10 U	10 U	10 U	11 U	10 UJ	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	10 U	10 U	10 U	10 U	11 U	10 UJ	10 U	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 U	10 U	10 U	10 U	11 U	10 UJ	10 U	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 U	10 U	10 U	10 U	11 U	10 UJ	10 U	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 U	10 U	10 U	10 U	11 U	10 UJ	10 U	10 U	10 U
Carbazole	µg/L	10 U	10 U	10 U	10 U	120	10 UJ	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U	11 U	10 UJ	10 U	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 U	10 U	10 U	10 U	11 U	10 UJ	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	10 U	10 U	10 U	14	14 J	10 U	10 U	10 U
Fluorene	µg/L	10 U	10 U	10 U	10 U	100	110	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 U	10 U	10 U	10 U	11 U	10 UJ	10 U	10 U	10 U
Naphthalene	µg/L	10 U	10 U	10 U	10 U	1,000	920	10 U	10 U	10 U
Phenanthrene	µg/L	10 U	10 U	10 U	10 U	120	130	10 U	11	10 U
Pyrene	µg/L	10 U	10 U	10 U	10 U	11 U	11 J	10 U	10 U	10 U
Conventional										
Cyanide	mg/L	0.266	0.2 U	0.2 U	0.305	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Notes:
U - Indicates that the constituent was not detected at the reported detection limit.

J - Indicates an estimated value. The constituent was positively identified. However, the result was less than the quantitation limit but greater than zero; or based on the data evaluation, the associated result is an approximate concentration of the constituent in the sample.

UJ - Indicates that the constituent was not detected above the reporting limit. However, based on the data evaluation, the reported result is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the concentration of the constituent in the sample.

SUMMARY OF AQUEOUS PLUME WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
JUNE 2015 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	LM-01AR	LM-02A	MM-02A	MM-03A	MRW-01	FD05192015 Duplicate of MRW-01	MRW-02	MW-14	MZ-02AR
Volatiles										
Benzene	µg/L	151	5 U	11	151	574	549	5 U	5 U	6
Ethylbenzene	µg/L	9	5 U	5 U	18	32	34	5 U	5 U	5 U
Toluene	µg/L	35	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	25	5 U	5 U	13	69	74	5 U	5 U	5 U
Semi-Volatiles										
2,4-Dimethylphenol	µg/L	34	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acenaphthene	µg/L	26	10 U	10 U	10 U	153	152	30	35	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U	14	14	10 U	10 U	10 U
Benzo(a)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	21	10 U	10 U	10 U	79	76	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	14	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	µg/L	10 U	10 U	10 U	10 U	99	96	17	16	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	328	10 U	10 U	24	810	818	10 U	10 U	10 U
Phenanthrene	µg/L	10 U	10 U	10 U	10 U	91	89	17	14	10 U
Pyrene	µg/L	10 U	12	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Conventional										
Cyanide	mg/L	0.2 U	0.2 U	0.2 U	5.1	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Note:
U - Indicates that the constituent was not detected at the reported detection limit.

[22] These tables are taken from the September 2014, June 2015, March 2016, September 2017 and June 2018 Shallow Groundwater Monitoring Reports.

SUMMARY OF AQUEOUS PLUME WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
MARCH 2016 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	LM-01AR	LM-02A	MM-02A	MM-03A	MRW-01	FD03152016	MRW-02	MW-14	MZ-02AR
							Duplicate of MRW-01			
Volatiles										
Benzene	µg/L	51	5 U	5 U	5 U	291	266	5 U	5 U	25
Ethylbenzene	µg/L	5 U	5 U	5 U	30	6	7	5 U	5 U	5 U
Toluene	µg/L	13	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	7	5 U	5 U	11	29	27	5 U	5 U	5 U
Semi-Volatiles										
2,4-Dimethylphenol	µg/L	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acenaphthene	µg/L	10 U	10 U	10 U	10 U	119	114	26	30	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	10 U	10 U	10 U	10 U	25	25	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	µg/L	10 U	10 U	10 U	10 U	56	54	14	12	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	95	10 U	10 U	10 U	119	122	10 U	10 U	10 U
Phenanthrene	µg/L	10 U	10 U	10 U	10 U	30	34	23	10 U	10 U
Pyrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Conventional										
Cyanide	mg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Note:
U - Indicates that the constituent was not detected at the reported detection limit.

SUMMARY OF AQUEOUS PLUME WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
DECEMBER 2016 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	LM-01AR	FD12142016	LM-02A	MM-02A	MM-03A	MRW-01	MRW-02	MW-14	MZ-02AR
			Duplicate of LM-01AR							
Volatiles										
Benzene	µg/L	134	157	5 U	5 U	3,440	263	5 U	5 U	5 U
Ethylbenzene	µg/L	9.3	11	5 U	5 U	696	5 U	5 U	5 U	5 U
Toluene	µg/L	33	36	5 U	5 U	420	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	28	32	5 U	5 U	1,300	27	5 U	5 U	5 U
Semi-Volatiles										
2,4-Dimethylphenol	µg/L	26	35	10 U	10 U	369 J	10 U	10 U	10 U	10 U
Acenaphthene	µg/L	25	27	10 U	10 U	11 J	200	10 U	16	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	13	10 U	10 U	10 U
Benzo(a)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	29	32	10 U	10 U	39 J	16	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	11	10 U	10 U	16 J	10 U	10 U	10 U	10 U
Fluorene	µg/L	14	15	10 U	10 U	12 J	74	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	400	434	10 U	10 U	3,190 J	220	10 U	10 U	10 U
Phenanthrene	µg/L	17	19	13	10 U	15 J	70	10 U	10 U	10 U
Pyrene	µg/L	10 U	10 U	10 U	10 U	13 J	10 U	10 U	10 U	10 U
Conventional										
Cyanide	mg/L	0.37	0.38	0.2 U	0.2 U	1.6	0.2 U	0.2 U	0.2 U	0.32

Note:
U - Indicates that the constituent was not detected at the reported detection limit.

SUMMARY OF AQUEOUS PLUME WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
SEPTEMBER 2017 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	LM-01AR	FD092717	LM-02A	MM-02A	MM-03A	MRW-01	MRW-02	MW-14	MZ-02AR
			Duplicate of LM-01AR							
Volatiles										
Benzene	µg/L	88 J	55 J	5 UJ	5 U	334	611	5 U	5 U	6.5
Ethylbenzene	µg/L	11 J	10 J	5 UJ	5 U	23	47	5 U	5 U	5.4
Toluene	µg/L	11 J	9.2 J	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	26 J	23 J	5 UJ	5 U	50	73	5 U	5 U	18
Semi-Volatiles										
2,4-Dimethylphenol	µg/L	27 J	21 J	11 UJ	10 U	62	10 U	10 U	10 U	10 U
Acenaphthene	µg/L	26 J	24 J	11 UJ	10 U	10 U	321	36	34	10 U
Acenaphthylene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	24	10 U	10 U	10 U
Benzo(a)anthracene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	37 J	33 J	11 UJ	10 U	10 U	79	10 U	10 U	10 U
Chrysene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	12 J	12 J	11 UJ	10 U	10 U	17	11	10 U	10 U
Fluorene	µg/L	16 J	14 J	11 UJ	10 U	10 U	195	21	15	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	355 J	282 J	11 UJ	10 U	153	768	10 U	10 U	10 U
Phenanthrene	µg/L	20 J	17 J	11 UJ	10 U	10 U	121	21	10 U	10 U
Pyrene	µg/L	10 UJ	10 UJ	11 UJ	10 U	10 U	11	10 U	10 U	10 U
Conventional										
Cyanide	mg/L	0.41 J	0.4 J	0.2 UJ	0.2 U	1.2	0.2 U	0.2 U	0.2 U	0.2 U

Notes:

1. U - Indicates that the constituent was not detected at the reported detection limit.
2. UJ - Indicates that the constituent was not detected above the reporting limit but, due to cooler temperature exceeding 10 degrees Celsius, the result is also estimated "J".
3. J - Indicates estimated value since cooler temperature exceeded 10 degrees Celsius; and for samples LM-01AR and its duplicate FD092717 the RPD for benzene, naphthalene, and 2,4-dimethylphenol exceeded 20%.

SUMMARY OF AQUEOUS PLUME WELL SAMPLES GROUNDWATER ANALYTICAL RESULTS
JUNE 2018 EVENT

SCE&G Calhoun Park Area Site
Charleston, South Carolina

CONSTITUENT	UNITS	LM-01AR	FD061318	LM-02A	MM-02A	MM-03A	MRW-01	MRW-02	MW-14	MZ-02AR
			Duplicate of LM-01AR							
Volatiles										
Benzene	µg/L	80.8	79.9	5 U	6.3	61	258	5 U	5 U	194
Ethylbenzene	µg/L	8.3	8.4	5 U	5 U	15.5	5.9	5 U	5 U	31.7
Toluene	µg/L	16.5	17.1	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Total Xylenes	µg/L	19.6	20.1	5 U	5 U	19.8	22.7	5 U	5 U	19.2
Semi-Volatiles										
2,4-Dimethylphenol	µg/L	18.3	18.4	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acenaphthene	µg/L	17.7	17.6	10 U	10 U	10 U	185	10 U	21.2	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	13.4	10 U	10 U	10 U
Benzo(a)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	28.9	31.6	10 U	10 U	10 U	29.2	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	14.3	12.8	10 U	10 U	10 U	11.9	10 U	10 U	10 U
Fluorene	µg/L	11.8	12.5	10 U	10 U	10 U	87.9	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	405	354	10 U	10 U	14	218	10 U	10 U	10 U
Phenanthrene	µg/L	14.3	15.2	10 U	10 U	10 U	68.4	10 U	10 U	10 U
Pyrene	µg/L	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Conventional										
Cyanide	mg/L	0.25	0.26	0.0083	0.042	1.2	0.039	0.005 U	0.005 U	0.06

Notes:

1. U - Indicates that the constituent was not detected at the reporting limit.

Figure I-11: Groundwater Results for the Upper Intermediate Sand Unit from the FYR Period[23]

SUMMARY OF UPPER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - JUNE 2014 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-03D	BM-04D	BM-08B	MM-13C	PAMW-02
Volatiles							
Benzene	µg/L	5	**30,000**	**15,000**	**2,600**	**34,000**	5 U
Ethylbenzene	µg/L	700	**3,600**	**1,300**	450	**3,200**	5 U
Toluene	µg/L	1,000	320 J	75 J	190	330 J	5 U
Xylenes, Total	µg/L	10,000	1,300 J	660	230	1,000 J	5 U
Semi-Volatiles							
2,4-Dimethylphenol	µg/L	700	85 UJ	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 UJ	10 U	10 U	10 U	10 U
Carbazole(1)	µg/L	5	**16 J**	10 U	10 U	10 U	10 U
Naphthalene	µg/L	1,500	**10,000**	**5,700**	85	**3,900**	10 U

Notes:

J - Indicates an estimated value. The constituent was positively identified. However, the result was less than the quantitation limit but greater than zero; or based on the data evaluation, the associated result is an approximate concentration of the constituent in the sample.

U - Indicates the consitutent was not detected at the reported detection limit.

UJ - Indicates that the constituent was not detected above the reporting limit or above the Method Detection Limit (MDL).

Bolded value indicates that the concentration is above the groundwater cleanup goal.

[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.

(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

SUMMARY OF UPPER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - MARCH 2015 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-03D	BM-04D	BM-08B	MM-13C	PAMW-02
Volatiles							
Benzene	µg/L	5	**27,500**	**11,400**	**1,180**	**1,540**	**52**
Ethylbenzene	µg/L	700	**2,400**	**1,090**	345	146	5 U
Toluene	µg/L	1,000	93	57	104	13	5 U
Xylenes, Total	µg/L	10,000	611	607	190	52	5 U
Semi-Volatiles							
2,4-Dimethylphenol	µg/L	700	10 U	84 UJ	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 U	10 UJ	10 U	10 U	10 U
Carbazole(1)	µg/L	5	10 U	12 UJ	10 U	10 U	10 U
Naphthalene	µg/L	1,500	**13,300**	**7,650**	714	**3,460**	10 U

Notes:

U - Indicates the consitutent was not detected at the reported detection limit.

UJ - Indicates that the constituent was not detected above the reporting limit or above the Method Detection Limit (MDL).

Bolded value indicates that the concentration is above the groundwater cleanup goal.

[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.

(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

[23] These tables are taken from the June 2014, March 2015, December 2015, September 2016, June 2017 and March 2018 Intermediate Groundwater Monitoring Reports.

SUMMARY OF UPPER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - DECEMBER 2015 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-03D	BM-04D	MM-13C	PAMW-02
Volatiles						
Benzene	µg/L	5	**26,300**	**21,400**	**33,000**	**63**
Ethylbenzene	µg/L	700	**3,280**	27 UJ	**3,140**	5 U
Toluene	µg/L	1,000	134 J	112 J	270 J	5 U
Xylenes, Total	µg/L	10,000	756	39 UJ	1,070	5 U
Semi-Volatiles						
2,4-Dimethylphenol	µg/L	700	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U	10 U
Carbazole(1)	µg/L	5	10 U	10 U	10 U	10 U
Naphthalene	µg/L	1,500	**10,800**	**9,020**	**3,500**	10 U

Notes:

U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.

UJ - Indicates that the constituent was not detected above the reporting limit ot the method detection limit.

J - Indicates that the constituent was detected above the reporting limit but below the diluted project limit.

Bolded value indicates that the concentration is above the groundwater cleanup goal.

[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.

(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

SUMMARY OF UPPER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - SEPTEMBER 2016 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-03D	BM-04D	MM-13C	PAMW-02
Volatiles						
Benzene	µg/L	5	**26,200 J**	**20,200**	**25,500**	5 U
Ethylbenzene	µg/L	700	**3,470 J**	**1,760**	**2,650**	5 U
Toluene	µg/L	1,000	146 J	168 J	203 J	5 U
Xylenes, Total	µg/L	10,000	439 J	778 J	755 J	5 U
Semi-Volatiles						
2,4-Dimethylphenol	µg/L	700	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U	10 U
Carbazole(1)	µg/L	5	10 U	10 U	10 U	10 U
Naphthalene	µg/L	1,500	**9,640 J**	**8,310**	**3,610**	10 U

Notes:

U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.

UJ - Indicates that the constituent was not detected above the reporting limit ot the method detection limit.

J - Indicates that the constituent was detected above the reporting limit but below the diluted project limit.

Bolded value indicates that the concentration is above the groundwater cleanup goal.

[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.

(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

SUMMARY OF UPPER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - JUNE 2017 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-03D	BM-04D	MM-13C	PAMW-02
Volatiles						
Benzene	µg/L	5	**23,300**	**18,700**	**18,300**	5 U
Ethylbenzene	µg/L	700	**3,800**	**2,410**	**1,860**	5 U
Toluene	µg/L	1,000	132 J	338 J	169 J	5 U
Xylenes, Total	µg/L	10,000	759	1,290	678 J	5 U
Semi-Volatiles						
2,4-Dimethylphenol	µg/L	700	17 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U	10 U
Naphthalene	µg/L	1,500	**11,800**	**9,730**	**4,560**	10 U

Notes:

U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.

J - Indicates that the constituent was detected between the laboratory method detection limit and the diluted project limit.

Bolded value indicates that the concentration is above the groundwater cleanup goal.

[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.

(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

SUMMARY OF UPPER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - MARCH 2018 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-03D	BM-04D	MM-13C	PAMW-02
Volatiles						
Benzene	µg/L	5	**21,400**	**12,600**	**26,400**	**906**
Ethylbenzene	µg/L	700	**2,900**	**1,170**	**2,750**	5 U
Toluene	µg/L	1,000	123 J	62.2 J	196 J	5 U
Xylenes, Total	µg/L	10,000	468 J	286 J	704 J	5 U
Semi-Volatiles						
2,4-Dimethylphenol	µg/L	700	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U	10 U
Naphthalene	µg/L	1,500	**10,900**	**6,550**	**2,760**	10 U

Notes:

U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.

J - Indicates that the constituent was detected between the laboratory method detection limit and the diluted project limit.

Bolded value indicates that the concentration is above the groundwater cleanup goal.

[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.

(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

Figure I-12: Groundwater Results for the Middle Intermediate Sand Unit from the FYR Period[24]

SUMMARY OF MIDDLE INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - JUNE 2014 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-07C	BM-10C	CM-11D	LM-08C	LM-09B	MM-02D	MM-02D Duplicate	MM-12B	MM-14C	NM-06D	PM-01C
Volatiles													
Benzene	µg/L	5	5 U	7,700	5 U	5 U	5 U	27,000	27,000	500	7.5	5 U	1,900
Ethylbenzene	µg/L	700	5 U	680	5 U	5 U	5 U	83 J	73 J	57	5 U	5 U	6.3 J
Toluene	µg/L	1,000	5 U	200 J	5 U	5 U	5 U	69 Jj	36 Jj	5 U	5 U	5 U	5 UJ
Xylenes, Total	µg/L	10,000	5 U	320 J	5 U	5 U	5 U	300 Jj	120 Jj	47	5 U	5 U	11 J
Semi-Volatiles													
2,4-Dimethylphenol	µg/L	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	1,500	10 U	830	10 U	10 U	12	3,900	3,700	23	10 U	10 U	10 U

Notes:

J - Indicates an estimated value. The constituent was positively identified. However, the result was less than the reported detection limit but greater than the Method Detection Limit (MDL).

U - Indicates the consitutent was not detected at the reported detection limit.

UJ - Indicates that the constituent was not detected above the reporting limit or above the MDL.

j - Indicates an estimated value. During data evaluation, the Relative Percent Difference between the sample and its duplicate exceeded 20% for the constituent.

Bolded value indicates that the concentration is above groundwater cleanup goal.

[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.

(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

SUMMARY OF MIDDLE INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - MARCH 2015 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-07C	BM-10C	CM-11D	LM-08C	LM-09B	MM-02D	MM-02D Duplicate	MM-12B	MM-14C	NM-06D	PM-01C
Volatiles													
Benzene	µg/L	5	5 U	6,510	5 U	5 U	5 U	26,000	24,900	491	5 U	5 U	1,510
Ethylbenzene	µg/L	700	5 U	768	5 U	5 U	5 U	62	58	52	5 U	5 U	5.6
Toluene	µg/L	1,000	5 U	158	5 U	5 U	5 U	11	10	5 U	5 U	5 U	5 U
Xylenes, Total	µg/L	10,000	5 U	309	5 U	5 U	5 U	88	82	18	5 U	5 U	13
Semi-Volatiles													
2,4-Dimethylphenol	µg/L	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Naphthalene	µg/L	1,500	10 U	996	10 U	10 U	10 U	2,540 J	4,660 J	11	10 U	10 U	10 U

Notes:

U - Indicates the consitutent was not detected at the reported detection limit.

UJ - Indicates that the constituent was not detected above the reporting limit or above the MDL.

J - Indicates an estimated value. During data evaluation, the Relative Percent Difference between the sample and its duplicate exceeded 20% for the constituent.

Bolded value indicates that the concentration is above groundwater cleanup goal.

[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.

(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

[24] These tables are taken from the June 2014, March 2015, December 2015, September 2016, June 2017 and March 2018 Intermediate Groundwater Monitoring Reports.

SUMMARY OF MIDDLE INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - DECEMBER 2015 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-10C	LM-08C	LM-09B	MM-02D	MM-02D Duplicate	MM-12B	MM-14C	NM-06D	PM-01C
Volatiles											
Benzene	µg/L	5	**9,890**	5 U	5 U	**21,400**	**20,000**	**392**	5 U	5 U	**1,210**
Ethylbenzene	µg/L	700	**719**	5 U	5 U	59 J	66 J	56	5 U	5 U	5 UJ
Toluene	µg/L	1,000	196	5 U	5 U	36 J	21 UJ	5 U	5 U	5 U	5 UJ
Xylenes, Total	µg/L	10,000	321	5 U	5 U	98 J	126 J	14	5 U	5 U	10 J
Semi-Volatiles											
2,4-Dimethylphenol	µg/L	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	1,500	1,220	10 U	17	**3,390**	**3,360**	10 U	10 U	10 U	10 U

Notes:

U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.

UJ - Indicates that the constituent was not detected above the reporting limit or above the method detection limit.

J - Indicates that the constituent was detected above the reporting limit or the method detection limit but below the diluted project limit.

Bolded value indicates that the concentration is above groundwater cleanup goal.

- Indicates that the well is located in a Sector that was treated with Fenton's reagent.

(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

SUMMARY OF MIDDLE INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - SEPTEMBER 2016 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-10C	LM-08C	LM-09B	MM-02D	MM-12B	MM-14C	NM-06D	PM-01C
Volatiles										
Benzene	µg/L	5	**7,370**	5 U	5 U	**23,400**	**339**	5 U	5 U	**947**
Ethylbenzene	µg/L	700	349	5 U	5 U	96 J	63	5 U	5 U	5 U
Toluene	µg/L	1,000	49 J	5 U	5 U	42	5 U	5 U	5 U	5 U
Xylenes, Total	µg/L	10,000	129 J	5 U	5 U	78	10	5 U	5 U	8 J
Semi-Volatiles										
2,4-Dimethylphenol	µg/L	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	1,500	385	10 U	15	**4,570**	10 U	10 U	10 U	11

Notes:

U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.

UJ - Indicates that the constituent was not detected above the reporting limit or above the method detection limit.

J - Indicates that the constituent was detected above the reporting limit or the method detection limit but below the diluted project limit.

Bolded value indicates that the concentration is above groundwater cleanup goal.

- Indicates that the well is located in a Sector that was treated with Fenton's reagent.

(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of

SUMMARY OF MIDDLE INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - JUNE 2017 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-10C	LM-08C	MM-02D	MM-12B	MM-14C	NM-06D	PM-01C
Volatiles									
Benzene	µg/L	5	**155**	5 U	**17,300**	**447**	**9**	5 U	**761**
Ethylbenzene	µg/L	700	5 U	5 U	58 U	67	5 U	5 U	5 U
Toluene	µg/L	1,000	5 U	5 U	73 U	5 U	5 U	5 U	5 U
Xylenes, Total	µg/L	10,000	5 U	5 U	80 J	13	5 U	5 U	11 J
Semi-Volatiles									
2,4-Dimethylphenol	µg/L	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	1,500	10 U	10 U	**5,060**	10 U	10 U	10 U	10 U

Notes:
U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.
J - Indicates that the constituent was detected between the laboratory method detection limit and the diluted project limit.
Bolded value indicates that the concentration is above the groundwater cleanup goal.
[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.
(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

SUMMARY OF MIDDLE INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS - MARCH 2018 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	BM-10C	LM-08C	MM-02D	MM-12B	MM-14C	NM-06D	PM-01C
Volatiles									
Benzene	µg/L	5	**5,230**	5 U	**28,000**	**507**	5 U	5 U	**587**
Ethylbenzene	µg/L	700	307	5 U	123 J	57.5	5 U	5 U	5 U
Toluene	µg/L	1,000	29.6 J	5 U	58 U	5 U	5 U	5 U	5 U
Xylenes, Total	µg/L	10,000	169 J	5 U	78 U	10.2 J	5 U	5 U	6.9 J
Semi-Volatiles									
2,4-Dimethylphenol	µg/L	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	1,500	411	10 U	**5,060**	10 U	10 U	10 U	10 U

Notes:
U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.
J - Indicates that the constituent was detected between the laboratory method detection limit and the diluted project limit.
Bolded value indicates that the concentration is above the groundwater cleanup goal.
[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.
(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

Figure I-13: Groundwater Results for the Lower Intermediate Sand Unit from the FYR Period[25]

SUMMARY OF LOWER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS
JUNE 2014 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	MM-01D	MM-16D
Volatiles				
Benzene	µg/L	5	**150**	**110**
Ethylbenzene	µg/L	700	5 U	5 U
Toluene	µg/L	1,000	5 U	5 U
Xylenes, Total	µg/L	10,000	5 U	26
Semi-Volatiles				
2,4-Dimethylphenol	µg/L	700	10 U	160
Benzo(a)pyrene	µg/L	0.2	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U
Naphthalene	µg/L	1,500	10 U	10 U

Notes:
U - Indicates the consitutent was not detected at the reported detection limit.
Bolded value indicates that the concentration is above groundwater cleanup goal.
(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

SUMMARY OF LOWER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS
MARCH 2015 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	MM-01D	MM-16D
Volatiles				
Benzene	µg/L	5	**86**	**67**
Ethylbenzene	µg/L	700	5 U	5 U
Toluene	µg/L	1,000	5 U	5 U
Xylenes, Total	µg/L	10,000	5 U	20
Semi-Volatiles				
2,4-Dimethylphenol	µg/L	700	NA	115
Benzo(a)pyrene	µg/L	0.2	NA	10 U
Carbazole[1]	µg/L	5	NA	10 U
Naphthalene	µg/L	1,500	NA	10 U

Notes:
U - Indicates the consitutent was not detected at the reported detection limit.
NA - Not available.
Bolded value indicates that the concentration is above groundwater cleanup goal.
(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

[25] These tables are taken from the June 2014, March 2015, December 2015, September 2016, June 2017 and March 2018 Intermediate Groundwater Monitoring Reports.

SUMMARY OF LOWER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS
DECEMBER 2015 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	MM-01D	MM-16D
Volatiles				
Benzene	µg/L	5	**32**	**43**
Ethylbenzene	µg/L	700	5 U	5 U
Toluene	µg/L	1,000	5 U	5 U
Xylenes, Total	µg/L	10,000	5 U	18
Semi-Volatiles				
2,4-Dimethylphenol	µg/L	700	10 U	**126**
Benzo(a)pyrene	µg/L	0.2	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U
Naphthalene	µg/L	1,500	10 U	10 U

Notes:
U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.
Bolded value indicates that the concentration is above groundwater cleanup goal.
(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

SUMMARY OF LOWER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS
SEPTEMBER 2016 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	MM-01D	MM-16D	MM-16D Duplicate
Volatiles					
Benzene	µg/L	5	**21**	**39**	**40**
Ethylbenzene	µg/L	700	5 U	5 U	5 U
Toluene	µg/L	1,000	5 U	5 U	5 U
Xylenes, Total	µg/L	10,000	5 U	17	18
Semi-Volatiles					
2,4-Dimethylphenol	µg/L	700	10 U	75	94
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U
Naphthalene	µg/L	1,500	10 U	10 U	10 U

Notes:
U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.
Bolded value indicates that the concentration is above groundwater cleanup goal.
(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

SUMMARY OF LOWER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS
JUNE 2017 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	MM-01D	MM-16D	MM-16D Duplicate
Volatiles					
Benzene	µg/L	5	11	29	28
Ethylbenzene	µg/L	700	5 U	5 U	5 U
Toluene	µg/L	1,000	5 U	5 U	5 U
Xylenes, Total	µg/L	10,000	5 U	18	17
Semi-Volatiles					
2,4-Dimethylphenol	µg/L	700	10 U	77	69
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U
Naphthalene	µg/L	1,500	10 U	10 U	10 U

Notes:
U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.
J - Indicates that the constituent was detected between the laboratory method detection limit and the diluted project limit.
Bolded value indicates that the concentration is above the groundwater cleanup goal.
[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.
(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

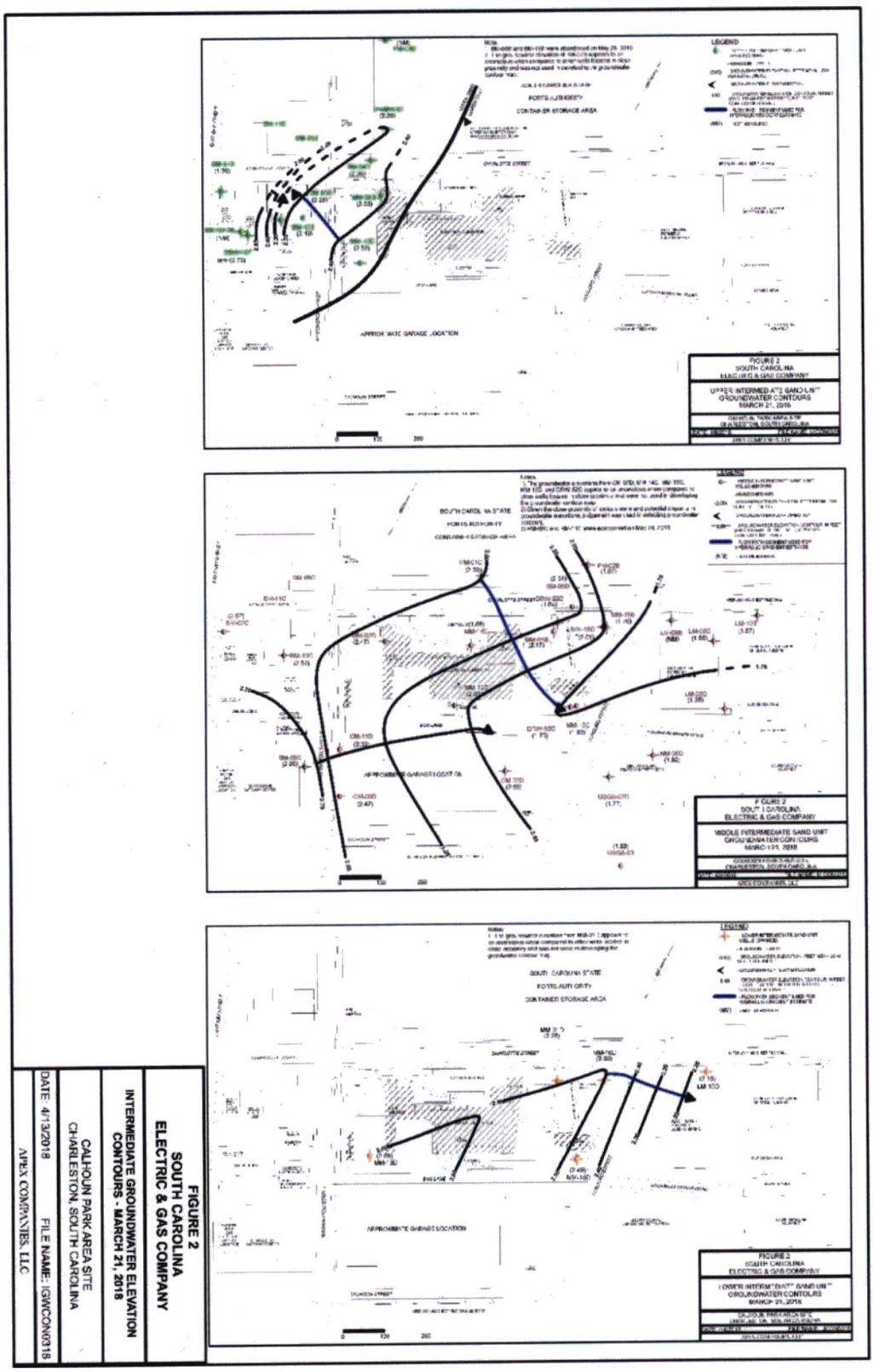
SUMMARY OF LOWER INTERMEDIATE SAND UNIT GROUNDWATER ANALYTICAL RESULTS
MARCH 2018 EVENT
INTERMEDIATE GROUNDWATER MONITORING PROGRAM

SCE&G Calhoun Park Area Site
Charleston, South Carolina

Constituent	Units	Cleanup Goal (µg/L)	MM-01D	MM-16D	MM-16D Duplicate
Volatiles					
Benzene	µg/L	5	5 U	15.7	15.5
Ethylbenzene	µg/L	700	5 U	5 U	5 U
Toluene	µg/L	1,000	5 U	5 U	5 U
Xylenes, Total	µg/L	10,000	5 U	11.6	11.4
Semi-Volatiles					
2,4-Dimethylphenol	µg/L	700	10 U	26.5	26.9
Benzo(a)pyrene	µg/L	0.2	10 U	10 U	10 U
Carbazole[1]	µg/L	5	10 U	10 U	10 U
Naphthalene	µg/L	1,500	10 U	10 U	10 U

Notes:
U - Indicates the consitutent was not detected at the reported detection limit or the undiluted project limit.
J - Indicates that the constituent was detected between the laboratory method detection limit and the diluted project limit.
Bolded value indicates that the concentration is above the groundwater cleanup goal.
[ ] - Indicates that the well is located in a Sector that was treated with Fenton's reagent.
(1) Indicates cleanup goals derived from risk based calculations, rather than drinking water standards (MCLs). A revised goal of 53 µg/L has been proposed for shallow groundwater.

Figure I-14: Intermediate Groundwater Elevation Contours[26]



[26] Source: Figure 2 of the March 2018 Intermediate Groundwater Monitoring Results.

APPENDIX J – DETAILED ARARS REVIEW

Groundwater ARARs

According to the 1998 OU1 ROD and the 2002 OU2 ROD, groundwater cleanup goals are based on the MCLs specified by the Safe Water Drinking Act. Several compounds did not have MCLs, so risk-based numbers were derived for these compounds; see the toxicity review for these compounds in Appendix K. See Table J-1 below for a comparison of ROD cleanup goals to current MCLs. The MCLs for all groundwater COCs have not changed except for arsenic. However, arsenic was removed from the COC list in 2002, as the EPA and SCDHEC agreed that arsenic should be removed from the COCs based on the limited number of groundwater samples with arsenic concentrations above the MCL of 0.01 mg/L and the potential contribution of arsenic from non-site sources. Therefore, all of the Site's ARAR-based cleanup goals remain protective.

Table J-1: Groundwater ARARs Review

Groundwater COC	Media/OU	ROD Cleanup Goal (mg/L)	2019 MCL (mg/L)[b]	ARAR Change
Arsenic	Shallow groundwater/ OU1	0.05	0.010	More stringent
Cyanide	Shallow groundwater/ OU1	0.2	0.2	No change
Benzene	Shallow groundwater/ OU1 & Intermediate groundwater/ OU2	0.005	0.005	No change
Benzo(a)pyrene[a]	Shallow groundwater/ OU1 & Intermediate groundwater/ OU2	0.0002	0.0002	No change
Ethylbenzene	Shallow groundwater/ OU1 & Intermediate groundwater/ OU2	0.7	0.7	No change
Beryllium	Shallow groundwater/ OU1	0.004	0.004	No change
Lead	Shallow groundwater/ OU1	0.015	0.015	No change
Mercury	Shallow groundwater/ OU1	0.002	0.002	No change
Chromium	Shallow groundwater/ OU1	0.1	0.1	No change
Copper	Shallow groundwater/ OU1	1.3	1.3	No change
Toluene	Shallow groundwater/ OU1 & Intermediate groundwater/ OU2	1.0	1.0	No change
Xylenes (total)	Intermediate groundwater/ OU2	10.0	10.0	No change

Notes:

a. Represents PAHs as a group.

b. Accessed on 1/22/19 at https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations.

APPENDIX K – SCREENING-LEVEL RISK REVIEWS

Groundwater Cleanup Goals Screening-Level Risk Assessment

Some groundwater cleanup goals were based on chemical-specific ARARs; these were evaluated in Appendix J. For several COCs without chemical-specific ARARs, the EPA selected a health-based value for the cleanup goal.[27] To evaluate whether the health-based cleanup goals remain valid, the cleanup goals without current MCLs were compared to the EPA's RSLs for tapwater. RSLs incorporate current toxicity values and standard default exposure factors. As shown in Table K-1, the health-based cleanup goals remain valid except for the noncancer risk from 2,4-dimethylphenol and the noncancer and cancer risk from naphthalene.

During this FYR period, 2,4-dimethylphenol has been detected below the RSL of 360 µg/L or not detected in both shallow and intermediate groundwater, except for one slight exceedance of 369 J µg/L in December 2016 in MM-03. Naphthalene has been detected frequently above the ROD cleanup goal and above its RSL. Tapwater RSLs are conservative screening levels for drinking water, and the groundwater at the Site is not used for drinking; therefore, this does not affect current protectiveness. However, the cleanup goals for naphthalene and 2,4-dimethylphenol do not correspond to risks within the EPA's acceptable risk range; the EPA may reevaluate these cleanup goals to determine if they warrant updating.

Table K-1: Screening-Level Groundwater Risk Evaluation

Groundwater COC	Media/OU	ROD Cleanup Goal (µg/L)	Tap Water RSL[a] (µg/L)		Cancer Risk[b]	Noncancer Hazard Quotient (HQ)[c]
			1 x 10^{-6} Risk	HQ=1.0		
2,4-Dimethylphenol	Shallow groundwater/ OU1 & Intermediate groundwater/ OU2	700	-	360	-	**2**
Carbazole	Shallow groundwater/ OU1 & Intermediate groundwater/ OU2	5	-	-	-	-
Chrysene	Shallow groundwater/ OU1	20	25	-	8.0 x 10^{-7}	-
Chrysene	Shallow groundwater/ OU1	200[d]	25	-	8.0 x 10^{-6}	-
Naphthalene	Shallow groundwater/ OU1 & Intermediate groundwater/ OU2	1,500	0.17	6.1	**8.8 x 10^{-3}**	**246**
Nickel[e]	Shallow groundwater/ OU1	100	-	390	-	0.3

Notes:
a. November 2018 EPA RSLs were used for this screening and are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed 1/22/2019).
b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk: cancer risk = (cleanup goal ÷ cancer-based RSL) × 10^{-6}.
c. The noncancer HQs were calculated using the following equation: HQ = cleanup goal ÷ noncancer-based RSL.
d. The ROD cleanup goal for chrysene was 20 µg/L, but the June 2018 Shallow Groundwater Monitoring Report notes that the chrysene cleanup goal was changed to 200 µg/L and that this was approved in a SCDHEC letter dated May 23, 2002. Both values are reviewed in this screening-level risk evaluation.
e. Nickel as soluble salts.
- = EPA has not yet established toxicity values.
Bold = exceeds EPA's acceptable carcinogenic risk range (1 x 10^{-4} to 1 x 10^{-6}) or the noncancer HQ of 1.
µg/L = micrograms per liter

[27] The cleanup goal for nickel was originally MCL-based, but nickel no longer has an MCL and is therefore evaluated with health-based cleanup goals.

Vapor Intrusion Screening Level Risk Assessment

VOCs are present in groundwater at the Site. This FYR evaluates whether there are unacceptable risks from the vapor intrusion pathway based on current toxicity information and groundwater data. A screening-level vapor intrusion evaluation was performed using the most recent groundwater data from June 2018 under a commercial exposure scenario. The highest groundwater concentrations of each contaminant from the shallow wells were compared to conservative VISLs. The results of the screening indicate that the cumulative risk for all contaminants is within the EPA's risk range of 1×10^{-6} to 1×10^{-4} and equals the cumulative noncancer hazard quotient (HQ) target of 1 (Table K-2).

Table K-2: Screening-Level Vapor Intrusion Evaluation – June 2018 Monitoring Event

COC	Maximum Concentration from Shallow Wells in June 2018 (µg/L)[a]	2019 VISL Calculator[b]		
		Predicted Indoor Air Concentration (µg/m³)	Commercial	
			Cancer Risk	Noncancer HQ
Benzene	258	58.5	3.72×10^{-5}	0.5
Ethylbenzene	31.7	10.2	2.08×10^{-6}	0.002
Toluene	17.1	4.6	-	0.0002
Total xylenes	22.7	6.2	-	0.01
Naphthalene	405	7.3	2.02×10^{-5}	0.6
		Totals:	5.95×10^{-5}	1

Notes:

a. Maximum concentration for each COC from this sampling event used. Only detected volatile contaminants were included in this evaluation. Groundwater data are from Table 7 of the Shallow Groundwater Monitoring Results June 2018 Event Report.

b. Only volatile contaminants with established toxicity criteria for indoor air included in this evaluation. VISL calculator accessed 1/24/2019 at https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator using default assumptions.

- = cancer risk could not be calculated; toxicity values not established

µg/m³ = micrograms per cubic meter

µg/L = micrograms per liter

While the above VISL evaluated the maximum concentrations in June 2018, there is a seasonal trend at well MM-03A in which concentrations are highest in December. Figures I-3 and I-5 demonstrate this trend. Well MM-03A is located near the control building on the SCE&G property; therefore, this FYR also evaluated the potential for vapor intrusion at the control building. As noted in the Site's 2009 Assessment of Vapor Intrusion report (Technical Memorandum #004), the control building is used to house electrical equipment and is highly ventilated to maintain appropriate operating temperatures. The building is not occupied on a full-time basis but is used intermittently to perform required maintenance and monitoring tasks. Therefore, there is no complete vapor intrusion pathway in the control building, despite the presence of volatile groundwater contamination near the building.

Soil PRG Screening-Level Risk Assessment

Soil PRGs were based on risk rather than chemical-specific ARARs. To evaluate whether the risk-based PRGs remain valid, the PRGs were compared to the EPA's RSLs for a composite worker. RSLs incorporate current toxicity values and standard default exposure factors. As shown in Table K-3, the soil PRGs remain valid because they correspond to risk below or within EPA's carcinogenic risk range of 1×10^{-6} to 1×10^{-4} and below the target noncancer HQ of 1.

Table K-3: Screening-Level Soil Risk Evaluation – Commercial

Soil PRG	ROD PRG (mg/kg)	Composite Worker RSL (mg/kg)[a]		Cancer Risk[b]	Noncancer HQ[c]
		1 x 10^{-6} Risk	HQ=1.0		
Arsenic	7.6	3	480	2.5 x 10^{-6}	0.02
Benzo(a)pyrene (EQ)	1.7	2.1	220	8.1 x 10^{-7}	0.008

Notes:
a. November 2018 EPA RSLs were used for this screening and are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed 1/25/2019).
b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk: cancer risk = (cleanup goal ÷ cancer-based RSL) × 10^{-6}.
c. The noncancer HQs were calculated using the following equation: HQ = cleanup goal ÷ noncancer-based RSL.
mg/kg = milligrams per kilogram

As part of this FYR, the need for soil institutional controls on properties other than the SCE&G property was evaluated. To determine whether the PRGs used for soil remediation were protective of residential use (and therefore would not require institutional controls), a screening level risk assessment was conducted by comparing the PRGs to the EPA's current RSLs for a residential exposure scenario. As shown in Table K-4, the soil PRGs remain valid as they correspond to risk within the EPA's carcinogenic risk range of 1 x 10^{-6} to 1 x 10^{-4} and below the target noncancer HQ of 1. Therefore, institutional controls on other site properties are not warranted.

Table K-4: Screening-Level Soil Risk Evaluation – Residential

Soil PRG	ROD PRG (mg/kg)	Resident RSL (mg/kg)[a]		Cancer Risk[b]	Noncancer HQ[c]
		1 x 10^{-6} Risk	HQ=1.0		
Arsenic	7.6	0.68	35	1.1 x 10^{-5}	0.2
Benzo(a)pyrene (EQ)	1.7	0.11	18	1.5 x 10^{-5}	0.09

Notes:
a. November 2018 EPA RSLs were used for this screening and are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed 1/25/2019).
b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk: cancer risk = (cleanup goal ÷ cancer-based RSL) × 10^{-6}.
c. The noncancer HQs were calculated using the following equation: HQ = cleanup goal ÷ noncancer-based RSL.

Sediment Cleanup Goal Review

The 2002 OU2 ROD stated that the remedial goal for sediments was to address PAH-contaminated sediments with ESGTU HQs that were greater than 1. The 2002 ROD used the equilibrium sediment benchmarks from the EPA's 2000 guidance on Equilibrium Partitioning Sediment Guidelines for the Protection of Benthic Organisms: PAH Mixtures (EPA Final Draft dated April 5, 2000). These values were compared to the sediment benchmarks in the EPA's updated 2003 guidance; the values have not changed since 2000 (Table K-5).

Table K-5: Review of Equilibrium Sediment Benchmarks for PAHs

PAH	Equilibrium Sediment Benchmark in 2002 ROD[a] (µg/g)	Current Equilibrium Sediment Benchmark[b] (µg/g)	Benchmark Change
2-Methylnaphthalene	447	447	None
Acenaphthene	491	491	None
Acenaphthylene	452	452	None
Anthracene	594	594	None
Benzo(a)anthracene	841	841	None
Benzo(a)pyrene	965	965	None
Benzo(b)fluoranthene	979	979	None
Benzo(g,h,i)perylene	1095	1095	None
Benzo(k)fluoranthene	981	981	None
Carbazole	349	349[c]	None
Chrysene	844	844	None
Dibenzo(a.h)anthracene	1123	1123	None
Fluoranthene	707	707	None
Fluorene	538	538	None
Indeno(1,2,3-cd)pyrene	1115	1115	None
Naphthalene	385	385	None
Phenanthrene	596	596	None
Pyrene	697	697	None

Notes:

a. From Table 5-6 of 2002 ROD referred to as the critical concentration of PAH in sediment identified in EPA 2000 guidance.

b. Values from *Procedures for the derivation of equilibrium partitioning sediment benchmarks (ESBs) for the protection of benthic organisms: PAH mixtures*. EPA-600-R-02-013. Office of Research and Development, Washington, DC. 2003. https://clu-in.org/download/contaminantfocus/sediments/PAH-ESB.pdf (accessed 2/5/2019)

c. A value was not established so the lowest benchmark was selected.

µg/g = microgram per gram